MODEL AIRPLANE NEWS

11th Year of Publication

MAY, 1940

20c

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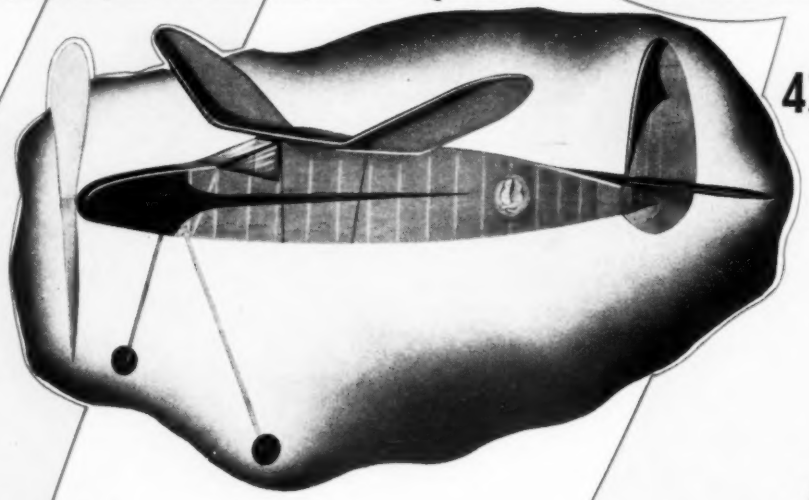

43" WINGSPAN

CONTENTS

21—1/8x1/8x22" balsa	.10
18—1/16x1/16x15" balsa	.04
6—1/16x1/16x22" balsa	.02
3—1/8x3/8x15" balsa	.03
1—3/4x1 1/2x1 7/8" balsa	.02
1—1/4x13/16x1 1/2" balsa	.01
4—strips bamboo	.04
1—12" length wire	.01
1—4" tube cement	.05
1—14" balsa prop	.14
2—1 1/2" wheels	.05
1—full size plan	.20
2—full size sheets tissue	.10
1—6x20 sheet tissue	.02
2—1/16x3x15" printed balsa	.10
1—1/16x3x5" printed balsa	.02
1—1/8x3x9" printed wood	.05
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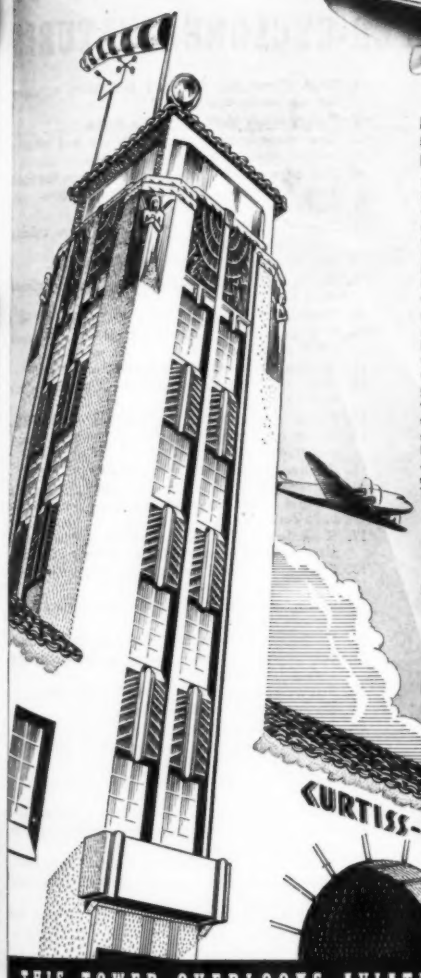

IN THE VERY CENTER AND A VERY IMPORTANT PART OF SOUTHERN CALIFORNIA'S GREAT AIRCRAFT INDUSTRY IS LOCATED CURTISS-WRIGHT TECHNICAL INSTITUTE.

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You, who plan to invest in a course of career training to prepare yourself for the future, must determine in advance what the returns will be on your investment before you put cash on the line. This is imperative since your choice of a school in which to take your training will determine how much money you will make all the rest of your life. Your whole future in aviation depends on your training.

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Aviation needs trained men. They are in demand and at a premium. Advancements for them are rapid, especially here in Southern California where there are over $234,000,000.00 in unfilled aircraft orders on hand and where over fifty per cent of all aircraft manufactured in the United States is made. You can get in on the ground floor by training now, BUT you must choose the right school for your training.

Our graduates are obtaining immediate employment and the demand for them far exceeds the supply. We honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation. This school has never guaranteed or promised positions for its graduates, but practically every graduate has obtained immediate employment, and all are advancing steadily.

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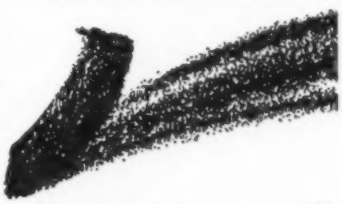

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NO OTHER ENGINE CAN MATCH THIS LIST OF SUPER-CYCLONE FEATURES

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17. H sectioned aluminum alloy con rod with over-sized bronze bearing inserts, bushed both ends.
18. Tubular hardened and ground full floating wrist pin.
19. Crank case has fins for air-cooling and appearance.
20. Removable exhaust stack.
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22. Serviceable aircraft steel engine mounts for fire wall installation.
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24. Six conversions to choose from.
25. Either dual or single ignition.
26. Upright models can be changed to inverted, or vice versa, without additional parts.
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28. Needle valve seat may be changed to either side.
29. Timer assembly 180 degrees reversible—easy to get at spark lever.
30. Comes all mounted and wired ready to install.
31. Manufactured by an old established aircraft concern.
32. SUPER-CYCLONE will fly any kit now on the market—WITH POWER TO SPARE—yet light enough for small jobs.

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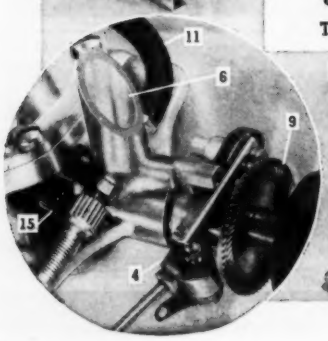
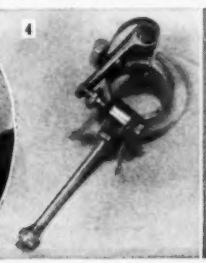
BORE 15/16 STROKE 15/16
CUBIC DISPLACEMENT .65 CU. INCHES

THE NUMBERS ON THESE FEATURES CORRESPOND WITH THE LIST ABOVE





. . . USE THIS HANDY ORDER BLANK **TODAY** ORDERS WILL BE FILLED IN ROTATION

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Complete Engine!

Super - Cyclone

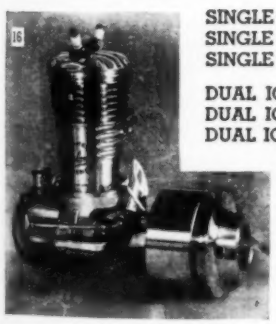
IS OUT OF THE TOY ENGINE CLASS

Our successful experience in the building of the preceding models of Baby Cyclone has enabled us to produce in the SUPER-CYCLONE the finest example of miniature engine engineering ever placed on the market at any price! It is an entirely new engine, with more sensational features and precision construction than any other engine, yet every improvement is based on a thorough knowledge of the problems involved. Aircraft Industries are pioneers in the miniature engine field, under the direction of Major C. C. Moseley, former war flyer and government test pilot. Mel Anderson, designer of models and miniature engines since 1915 and developer of the hollow rotary crank shaft principle, engineered the SUPER-CYCLONE. His knowledge of the application of this principle in the design of a new engine assures its utmost efficiency.

MORE HORSEPOWER

Using exactly the same propeller with all engines, SUPER-CYCLONE was tested against four of the most popular and well known engines in the 1/5 Horsepower Class—SUPER-CYCLONE turned up over 1000 R.P.M. more than any other engine!

Six Super-Cyclone Conversions



SINGLE IGNITION—UPRIGHT	$13.00
SINGLE IGNITION—INVERTED	$13.50
SINGLE IGNITION WITH FLYWHEEL Less Mounts	$14.00
DUAL IGNITION—UPRIGHT	$15.00
DUAL IGNITION—INVERTED	$15.50
DUAL IGNITION WITH FLYWHEEL Less Mounts	$16.00

And don't forget BABY CYCLONE, America's most popular engine for sport flying, still $9.00

The low prices for this sensational new engine are the result of buying direct from the manufacturer, whose production methods and tremendous volume of sales permit them to offer you the world's greatest value!

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- ☐ SUPER-CYCLONE Upright with Dual Ignition $15.00
- ☐ BABY CYCLONE Model "F" $9.00
- PROPELLERS—The finest quality obtainable $1.00
  - ☐ 14" for heavy ships
  - ☐ 13" for light ships and fast climb
  - ☐ 12" for Baby Cyclone
- ☐ SUPER-CYCLONE Inverted with Single Ignition $13.50
- ☐ SUPER-CYCLONE Inverted with Dual Ignition $15.50
- ☐ FLYWHEEL with washer and nut $1.25
- ☐ SUPER-CYCLONE Single Ignition with Flywheel $14.00
- ☐ SUPER-CYCLONE Dual Ignition with Flywheel $16.00
- ☐ STEEL MOUNTING BRACKETS ..... $.50

All SUPER-CYCLONE Engines completely assembled as described above.

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Model AIRPLANE News

11th YEAR OF PUBLICATION

VOL. XXII *No. 5*

Edited by Charles Hampson Grant

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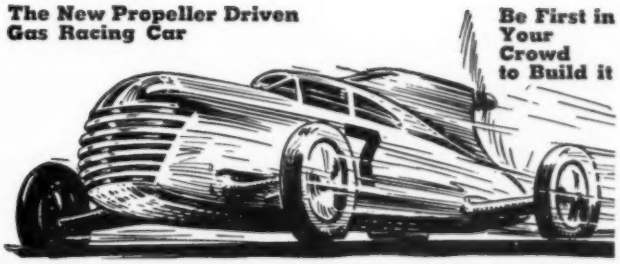
The New Propeller Driven Gas Racing Car

Be First in Your Crowd to Build it



Boyoboy! It's Absolutely Sensational!

"SPEEDSTER" AIRCAR

Even at twice the price—it would be a great buy—and just think, it costs less than a five dollar bill. No wonder everyone's talking about it—no wonder it's the hottest race car value in America today. And what a performance! So simple to build, too—all you need are—knife, sandpaper, screw driver, pliers, and brush for painting. No gears to pay for—simply power the Aircar with any kind of small bore engine, preferably ⅞" bore. Kit complete with rubber-tired wheels, and cable hooks—everything (except power unit and color). Order yours today. Kit AU-7, all for only..... **$4.50**

Cleveland Offers Brilliant Performers in Every Gas Class

Class "C"

Now in Each Class—
A. B. & C.—a Model of the Amazing

CLEVELAND "PLAYBOY"

PLAYBOY SR. (Class C). First model designed, we believe, in strict conformity with new N.A.A. Class C regulations. Design may also be converted into a neat cabin job. Span 80". Beautiful flights—with everything a winner should have. Complete Kit GP-5017 (except power unit) only..... **$3.95**

PLAYBOY JR. (Class B). No harder to build than a "Wakefield", yet praised as a standout in its class. Easy for beginners. An immediate "must" model with old timers for its remarkable performance. Span 46". Complete Kit GP-5006 (except power unit) only..... **$2.50**

BABY PLAYBOY (Class A). America's first dollar gas model. Performs better than many higher priced models. May be flown either with rubber or gas motor. Span 33". Complete Kit GP-5008 (except power unit) only..... **$1.00**

Start the RR of the Future!

CLEVELAND "All-American" GAGE

Growing more popular all the time. New items are constantly being introduced. Watch the trend in 1940 toward this most practical of all gages. Get started now, and keep abreast of the newest developments as you expand.

All "REP" kits below are 3/16" scale for ⅜" C-D gage and are dry (no liquids). Average over all sizes—Locomotives, 12"-17"; Box Cars, 8"; height 2½". Kits are complete with sides, tops and ends printed in authentic colors and lettering. All "REP" (cars only) models may be used in your operating layout later. We also make at $1.25 per kit any of the freight cars to operate.

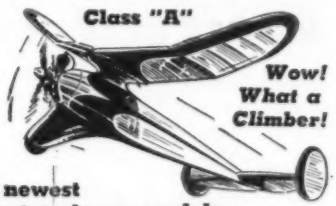
RL-1	PRR Switcher Loco	.50	
RL-3	C&O Pacific 4-6-2	.50	
	BOX CARS		
RB-1	NTC—40 ft. steel	.10	
RB-2	B&O—40 ft. steel	.10	
RB-3	B&M—40 ft. wood	.10	
RB-4	Rock. Is. 40' wood	.10	
RB-5	Wabash—40' wood	.10	
RB-6	GF 40' wood furn.	.10	
RB-7	T&P 40' wood auto	.10	
RB-8	AT&SF 40' wood	.10	
	HOPPER CARS		
RH-1	CCC&StL, HR.....	.10	
RH-2	Missouri Pac. HR	.10	
RH-3	Southern Railroad	.10	
RH-4	Illinois Central HR	.10	
	CABOOSE		
RC-1	PRR type N-5.....	.10	
	FLAT CARS		
RF-1	C&NW 46' 50 ton	.10	
RF-2	PRR 46' 50 ton.....	.10	
RF-3	B&M 46' 55 ton...	.10	
RF-4	L&N 46' 50 ton....	.10	
	GONDOLA CARS		
RG-1	L&N 41' 50 ton..	.10	
RG-2	NYC 41' 50 ton...	.10	
RG-3	MC 41' 55 ton....	.10	
RG-4	T&P 41' 55 ton...	.10	
	8000 GAL TANK CARS		
RT-1	Texaco—TCX (wh.)	.10	
RT-2	NATX (black).....	.10	
RT-3	Sinclair—SORX	.10	
RT-4	Gulf—GRCX (blk.)	.10	

America's Favorite

CLEVELAND "CLOUDSTER"

(CLASS B) No prettier—better performing gas model made. With improvements made in our original design—it's today's super value. And how Gas model builders have gone for it. If you haven't built it—get busy right now—you'll never regret it. Big 50" span. Streaked lightning in performance—marvelous air behavior. Complete Kit GP-5004 (except power unit) only.... **$2.50**

Class "A"



The newest departure in gas models

CLEVELAND ITSY-BITSY

The year's biggest dollar's worth. Employs parasol arrangement of polyhedral wing and monowheel landing gear. Radical—attracts crowds with its unorthodox design and brilliant flying. Watch the speed records fall! Power it with a ½" bore motor. Destined to be an outstanding contender in all 1940 Class "A" contests. Be first to build this "model of the future" in your crowd—get your Kit now. Complete Kit GP-5016 (except power unit) only..... **$1.00**

New Thrills with the Pace-Setting

"B" Class

CLEVELAND "FLEETSTER"

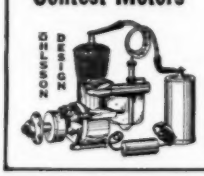
Sister ship of our popular Cloudster. Sleek, trim, fast—with its super-streamlined fuselage and lifting tail. Span 42½". Away out in front of the average commercial model in looks. Be sure to build it. Complete Kit GP-5007 (except power unit) only..... **$2.50**

CLEVELAND "CHAMPION"
(Designed by Korda)

Span 48". 22 oz. complete. Beautiful flyer. Complete Kit GP-5005 includes everything (except power unit)..... **$2.95**

Send Your Order Now for one of these fine

Contest Motors



For CLASS A	
Mighty Atom	$12.50
New Ohlsson "19"	14.50
For CLASS B	
Ohlsson "23"	$16.50
The new "Brownie"	$7.50
For CLASS C	
Sky Chief	$ 6.95
Brown, Jr. Model D	12.50
Brown, Jr. Model C	18.50
Brown, Jr. Model B	21.50
Dennymite Standard	15.85
Dennymite DeLuxe	17.85
Ohlsson "Custom 60"	21.50

(Mention upright or inverted)

C-D P26-A FIGHTER

Complete Kit SF-60 (Span 21") $2.25
Complete Dry Kit D-60 (Span 14") 85c

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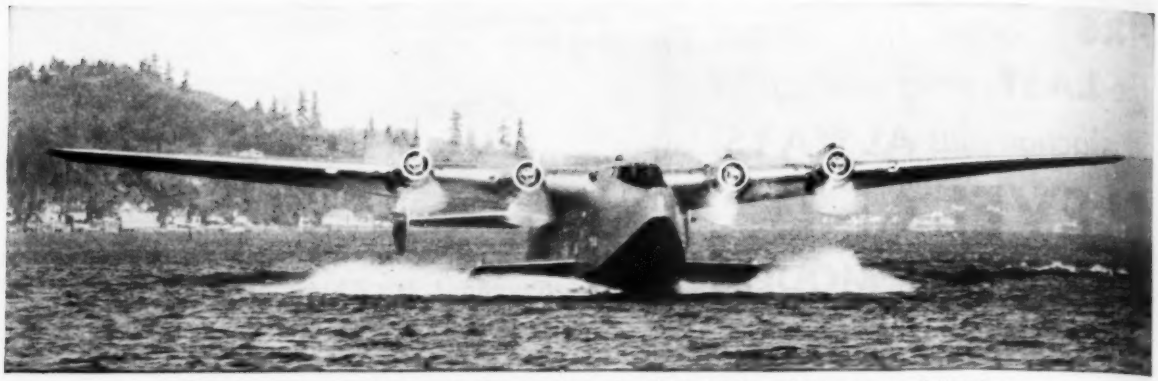


The 74 passenger Boeing Atlantic Clipper takes off with its 152 feet of wing span and 6000 hp.

WINGS ACROSS THE ATLANTIC

YOU now can contact your favorite travel agent and book scheduled passage around the world by air!

You pick up your phone and ask for reservations on the "Yankee Clipper," for this latest of American Clipper ships has played the leading role in the final chapter of "The Airline Around the World."

All of this is a part of pioneering America's new frontier of aviation. Ever since that curly-haired youth in his "Spirit of St. Louis" blazed the lone trail across the Atlantic twelve years ago, we of this modern age have seen a great saga of the air being written across the heavens. American wings have grown strong, fast and safe.

Pioneer of them all has been the Clipper ships, mighty wings that conquered the greatest of oceans—brought the trade and good will of the far east to American shores. As did their namesakes of old, the "sailing clippers" they have slashed time and distance from the trade routes of the world, introducing a new and greater type of merchant marine. Ships of the sky that sail the seas!

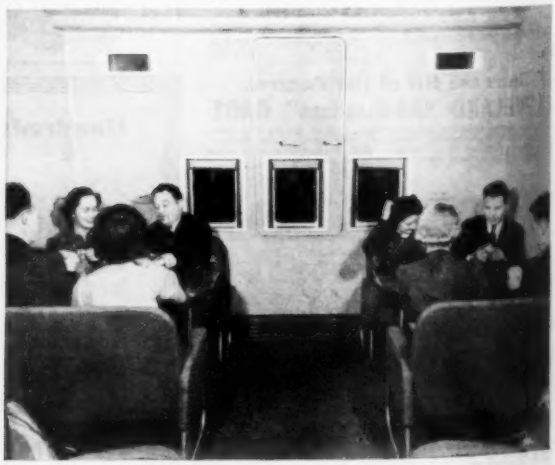
On the lips of many today is talk of this newest of Clippers, the ship designed to "whip the Atlantic" . . . Her greatness makes her the mightiest of man-made wings. Imagine a plane as large as a five room bungalow!

When Boeing engineers undertook to build this super flying boat they started one of the toughest problems in aeronautical history. What they had to produce was more than just an airplane; it was a machine age miracle, for this giant flying ship had to "carry a payload of five tons for 2400 miles against a 30 mile-an-hour headwind, at a cruising speed of 150 m.p.h., two miles in the air." That was in the contract, and the contract was the law.

More too, they had to produce an airplane which could be operated with as little amount as possible of fatigue to its crew and with a minimum of maintenance. Since this was to be primarily a passenger carrier, they had to efficiently provide unprecedented comfort, spaciousness and luxury for the

The 82,500 pound luxury airliner wings its way over land or sea

The spacious control room of the Boeing Clipper



The dining and recreation salon provides comfort

Two of the Clipper's 1400 hp. power plants

The man gives a striking comparison of its size

The Development of the Atlantic Clippers—Their Outstanding Features and How They Operate

By DOUGLAS J. INGELLS

passengers. And, of course, that big worry which puts gray hairs into aircraft manufacturers' heads, they had to make this craft the safest ship ever built.

To lift 10,000 pounds of payload into the air the engineers knew they would have to build a real giant. From their past experience with four-engined planes—the army's XB-15 bomber and the "Strato-liners"—it was decided that this new ship should likewise be powered by four motors. But this was to be eighty thousand pounds of airplane, a far heavier craft than any of those previous planes, so they were at a loss as to what type of power unit to use.

Four engines that could produce the power of two locomotives. That was what was needed. Where could such power units be found? That much power meant motors larger than any in commercial aviation.

Luck that favored the Clipper pilots of old came the way of the builders of these modern clippers, for to the aeronautical world for the first time, the Wright Corporation presented its 14-cylinder Wright GR-2600-A2 engines. . . . They were just the right answers to the big problem of motivation.

To help these double-row Wright engines pull the mighty craft through the air, Hamilton Standard Hydromatic full-feathering props were selected. Surely, engineers thought, with the four Wright engines developing 1500 horsepower each for take-off and 1200 horsepower each for normal flight, along with the aid of the three-bladed fourteen foot diameter hydromatics, this eighty thousand pounds of flying boat would get into the air and stay there.

"As aerodynamically clean as any ship that ever took to its wings" . . . this rule governed the design of the new clipper. They knew how to get the power. They knew how large the ship must be to lift its payload, so engineers worked night and day over draftsmen's boards, under bright lights, on the design that was to be Boeing's 314 Clipper.

All surfaces were to be cantilever. The wing, to cut down on structural weight was tapered, producing a thicker wing near the root and allowed passageways for the crew to get to the engines. (A safety measure that must not be overlooked.) But it allowed, too, more room to store the large cargo supply so necessary for this commercial airliner.

The hull was designed so that the center section of the wing passed through its upper portion in such a manner as to produce a clean intersection between hull and wing. This reduced the interference drag usually found with cabane arrangements where the wing is mounted above the hull. The bottom was designed with an athwartship main step and a pointed rear step; the pointed rear

(Continued on page 57)

The 165 m.p.h. sea giant about to take off

The pilot's station, controls and instrument panel

The flight engineer and his control board for engines

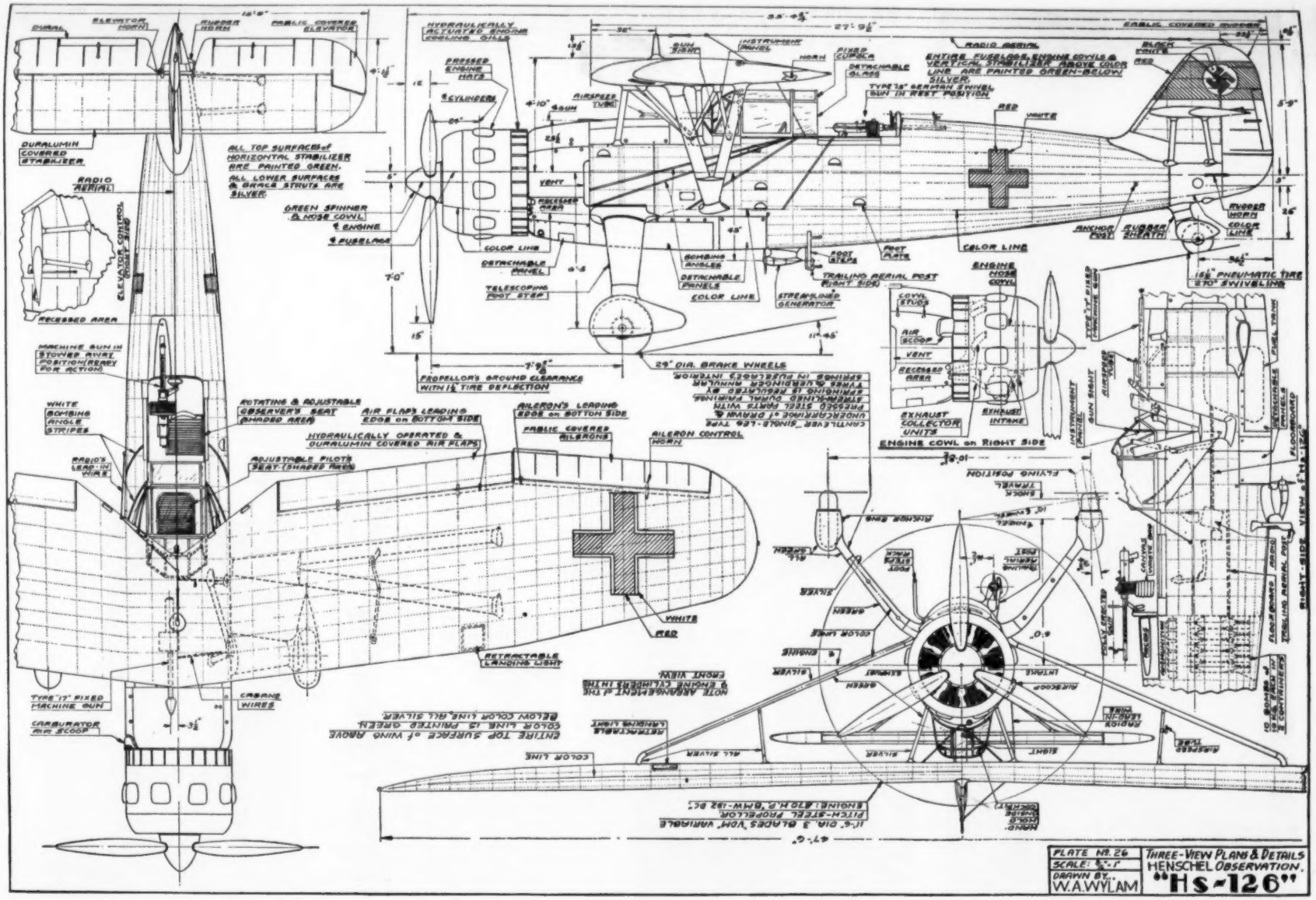
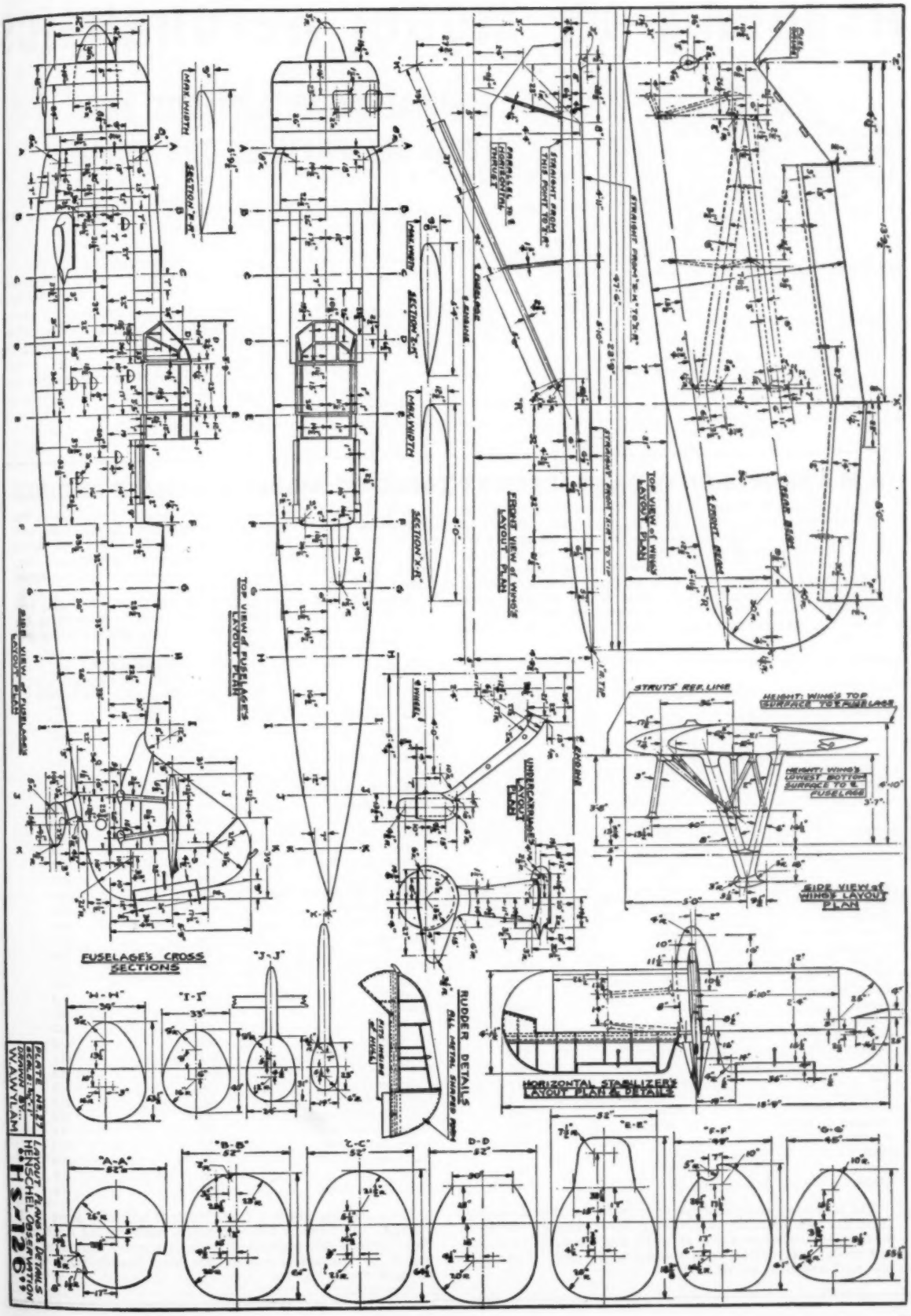


PLATE NO. 26
SCALE: 3/4"-1'
DRAWN BY W.A.WYLAM
THREE-VIEW PLANS & DETAILS
HENSCHEL OBSERVATION.
"Hs-126"
RIGHT SIDE VIEW
ENGINE COWL on RIGHT SIDE
FLYING POSITION
REAR VIEW
FRONT VIEW
ENTIRE FUSELAGE, ENGINE COWLS & VERTICAL STABILIZER ABOVE COLOR LINE ARE PAINTED GREEN-BELOW SILVER.
ALL TOP SURFACES of HORIZONTAL STABILIZER ARE PAINTED GREEN.
ALL LOWER SURFACES & BRACE STRUTS ARE SILVER.
HYDRAULICALLY OPERATED & DURALUMIN COVERED AIR FLAPS
RETRACTABLE LANDING LIGHT
ENTIRE TOP SURFACE of WING ABOVE COLOR LINE IS PAINTED GREEN BELOW COLOR LINE ALL SILVER.
NOTE ARRANGEMENT of THE 9 ENGINE CYLINDERS IN THE ENGINE COWL
ENGINE: 870 H.P. BMW-132 BC
PROPELLER: 11'-6" DIA. 3 BLADES 'VDM' VARIABLE PITCH-STEEL
47'-6"


HENSCHEL "Observation" Hs-126
LAYOUT PLANS & DETAILS
PLATE No. 27
SCALE: 1/4" = 1'-0"
DRAWN BY WAWYLAM
MAIN WIDTH
SECTION "E-E"
SECTION "F-F"
SECTION "X-X"
SIDE VIEW of FUSELAGE'S LAYOUT PLAN
TOP VIEW of FUSELAGE'S LAYOUT PLAN
FRONT VIEW of WINGS LAYOUT PLAN
TOP VIEW of WINGS LAYOUT PLAN
STRUTS' REF. LINE
HEIGHT: WING'S TOP SURFACE TO FUSELAGE
HEIGHT: WING'S LOWEST BOTTOM SURFACE TO E. FUSELAGE
SIDE VIEW of WINGS LAYOUT PLAN
UNDERCARRIAGE LAYOUT PLAN
FUSELAGE'S CROSS SECTIONS
"H-H"
"I-I"
"J-J"
RUDDER DETAILS
ALL METAL SHAPED RIBS
HORIZONTAL STABILIZER'S LAYOUT PLAN & DETAILS
"A-A"
"B-B"
"C-C"
D-D
"E-E"
"F-F"
"G-G"

Academy Of Model Aeronautics

OFFICIAL MODEL AIRPLANE NEWS FROM ALL PARTS OF THE WORLD

Prospects' Names Going to Chapters

Mailed to all Academy model chapters in good standing is a list of prospective members who have written to A.M.A. headquarters for membership details and, in many instances, expressed the desire to join a local modelplane club affiliated with or chapter of the Academy.

The list will be sent to the representative of each chapter and steps should be taken immediately to contact those listed in your vicinity. More than one thousand names and addresses are presented; whether the service continues will depend on the manner in which the individuals listed are treated.

Here's a splendid opportunity to increase the membership of your chapter with new and active model enthusiasts. Let's get going on a local and national membership drive!

New Contest Kits Nearly Ready

The Academy's new official contest kits are now ready. These kits contain 35 of the official competition armbands, two score cards for recording flights of 30 contestants, 4 timing pads which each contain 50 official flight timing slips, as well as other helpful material for conducting a modelplane meet. The entire kit comes in an attractive, durable "fibrestock" expanding-type carrying folder with a flap to protect the materials.

In the cases of large meets, the armbands will be available in larger quantities @ 3 for 5c; timing pads—10c each;

(Continued on page 32)

A M A PROVISIONAL DISPLACEMENT TABLE OF MODEL AIRCRAFT ENGINES

The new weight-displacement rule adopted by the Academy of Model Aeronautics requires that every gas model flown under the 1940 regulations must weigh at least 8 ounces for each 1/10 cubic inch of engine displacement. In order to spare contest directors the labor of calculating displacements and required weights at competitions, the following table has been prepared, which tabulates most of the engines which have been, or are about to be, manufactured, their displacements, and the minimum weight permitted models using these engines.

Use of the charts is as follows: model is brought to the inspection desk, weighed and projected wing area measured to determine wing loading—just as under 1939 rules. Then the checker inspects the engine, glances at the table and compares the required weight with the weight already found during the wing loading determinations.

No additional measurements are involved. The only new operation required under the 1940 rules is identifying the engine and referring to the table. This official listing will be revised when necessary.

ENGINE	DISPLACEMENT cu. in.	MINIMUM WEIGHT PERMITTED oz.
Ajax	.363	29
Alternate Firing Twin	.326	26.1
Atom	.098	7.9
Bantam (1939)	.164	13.1
Bantam (1940)	.199	15.9
Belmont	.564	45.1
Bonney "B"	.276	22.1
Bonney "C"	.488	39.0
Bonney "Super C"	.687	55.0
Brat (1939)	.156	12.5
Brown B, C, D	.601	48.1
Brownie	.290	23.2
Bunch	.450	36.0
Condor Midget	.182	14.6
(Baby) Cyclone "F"	.359	28.8
(Super) Cyclone "G"	.647	52.5
Dennymite	.572	45.8
Dragon	.210	16.8
Elf	.132	10.6
Falcon Junior	.199	15.9
Falcon	.562	44.9
Forster "29"	.296	23.7
Forster "B" and "99"	.997	79.8
G. H. Q.	.517	41.3
Gnat	.156	12.5
G-9	.564	45.1.
Gwin Aero	.450	36.0
Hi-Speed Bullet	.276	22.1
Hi-Speed Torpedo	.300	24.0
Hurleman Aristocrat	.488	39.1
Husky "J. V."	.192	15.4
James	.598	47.8
Kaydet	.163	13.1

ENGINE	DISPLACEMENT cu. in.	MINIMUM WEIGHT PERMITTED oz.
Little Dynamite	.375	30.0
Madewell	.148	11.8
M & M (1938)	.232	18.6
M & M (1939 Piston Valve)	.292	23.4
M & M (1940 Hi-Speed)	.278	22.2
M & M Twin-in-Line	.556	44.5
Mighty Midget	.450	36.0
Miniature	.104	8.3
Ohlsson "19"	.199	15.9
Ohlsson "23"	.230	18.4
Ohlsson "Gold Seal"	.562	45.0
Ohlsson "60 Custom"	.600	48.0
"O. K." Standard and Special	.604	48.3
"O. K." DeLuxe	.616	49.2
"O. K." Twin	1.208	96.6
Pee Wee	.140	11.2
Phantom	.276	22.1
Ranger "A"	.208	16.6
Ranger "B"	.292	23.4
Ranger "C"	.313	26.0
Rebel	.230	18.4
Sky Chief Junior	.199	15.9
Sky Chief	.562	42.2
Syncro Ace and Special	.564	45.1
Syncro Bee	.123	9.8
Tiger Aero	.450	36.0
Tom Thumb	.450	36.0
Trojan Junior (1938)	.192	15.4
Trojan Junior (1939)	.232	18.6
Trojan Junior (1940)	.250	20.0
Trojan Senior	.125	100.0
Wasp	.146	11.7
World Wide Demon	.156	12.5

The response throughout the country to the 1940 Academy rules has been unusually heartening. Every change has been warmly applauded as a step forward, and the decision to put gas model competition on a weight-displacement basis has met with approval on all fronts.

These listings are not final, but will officially serve until changes, additions or corrections are made by the Academy. New engines and changes in present engines should be reported by manufacturers to Academy headquarters when changes occur.

FUNDAMENTALS OF MODEL PLANE DESIGN

Designing The Propeller For Your First Model Plane

Chapter 2—Article 10

By CHARLES HAMPSON GRANT

DESIGNING the propeller is the most important task in the creation of an efficient model airplane. It not only must be well made but its proportions must be of specific value for the particular model upon which it is to be used.

There are five vital factors that are embodied in the design. They are: diameter, pitch, blade area, blade cross section shape and the shape of the outline of the blade. In the preceding article, appearing in the April issue of MODEL AIRPLANE NEWS, page 19, it was shown how, by the application of simple rules the correct values of the first three factors can be ascertained for any particular model plane. Also these values were derived for the one which is being designed; your first power driven plane. Now it is necessary to determine the characteristics of the last two factors.

The Blade Cross Section

Each blade should have a cambered cross section similar to that of a wing. This gives it greater efficiency; a large amount of thrust and little torque (resistance to rotation). However unlike the average wing, a propeller blade has cross sections of different shape at each point along the blade from its axis (or hub) to tip. It is made this way for two reasons. First, the strain on a blade, due to centrifugal force and to bending, is progressively greater at each point from tip to hub. Therefore the blade should be thicker and stronger near the hub than at a point close to the tip. Second, the speed with which any point of the blade passes through the air is proportional to its distance from the propeller axis. Therefore the tip of the blade travels much faster than any part of the blade nearer to the hub. Thin sections are adapted to high speeds and thicker ones to slow speeds. Consequently the blade should be proportionally thicker at each succeeding point from tip to hub.

Each section should be shaped like a wing section. An excellent type to use is one with a flat under-surface (rear surface on a propeller) and with a camber whose maximum height is at a point about 1/3 the chord back of the leading edge. Fig. 23 shows typical blade sections that should be used at various points along the blade from hub to tip.

Blade Outline

The most efficient outline of a propeller blade has long been a debatable point. There are as many opinions and theories concerning this as there are model designers. Many propellers having various types of outlines seem to give excellent results, but best results during many tests made by the author were obtained from propellers with the maximum blade width at a point about 2/3 the blade length out from the hub and with blade tip outlines that approximated an ellipse. Sharp pointed tips gave poorer results in the tests than fairly well-rounded tips. The dotted outline in Fig. 23 shows a typical efficient blade outline, so this type will be used on the model being designed.

Copyright 1940 by Charles Hampson Grant

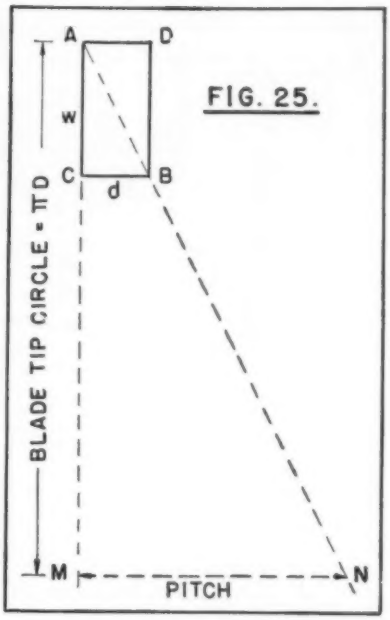


FIG. 25.

Designing the Propeller With the Required Characteristics

In order to make an accurate helical propeller, a definite and accurate system of cutting it from a wood block must be followed. The *simplest* accurate system is called "the diagonal method," the requirements of which are as follows:

First select a rectangular block of the correct length, width and depth. Then, on the front and rear faces, draw diagonal lines from corner to corner. These lines serve as guide lines for cutting out the propeller. Fig. 24 shows such a block with diagonal guide lines AA' and BB' on its rear face and lines CC' and DD' on its front face. Inside the block, outlines in heavy lines, is a propeller. The rear edges of the blades follows the line AA'. The leading

(Continued on page 66)

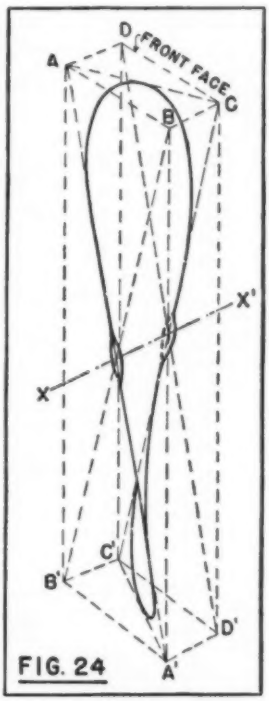


FIG. 24

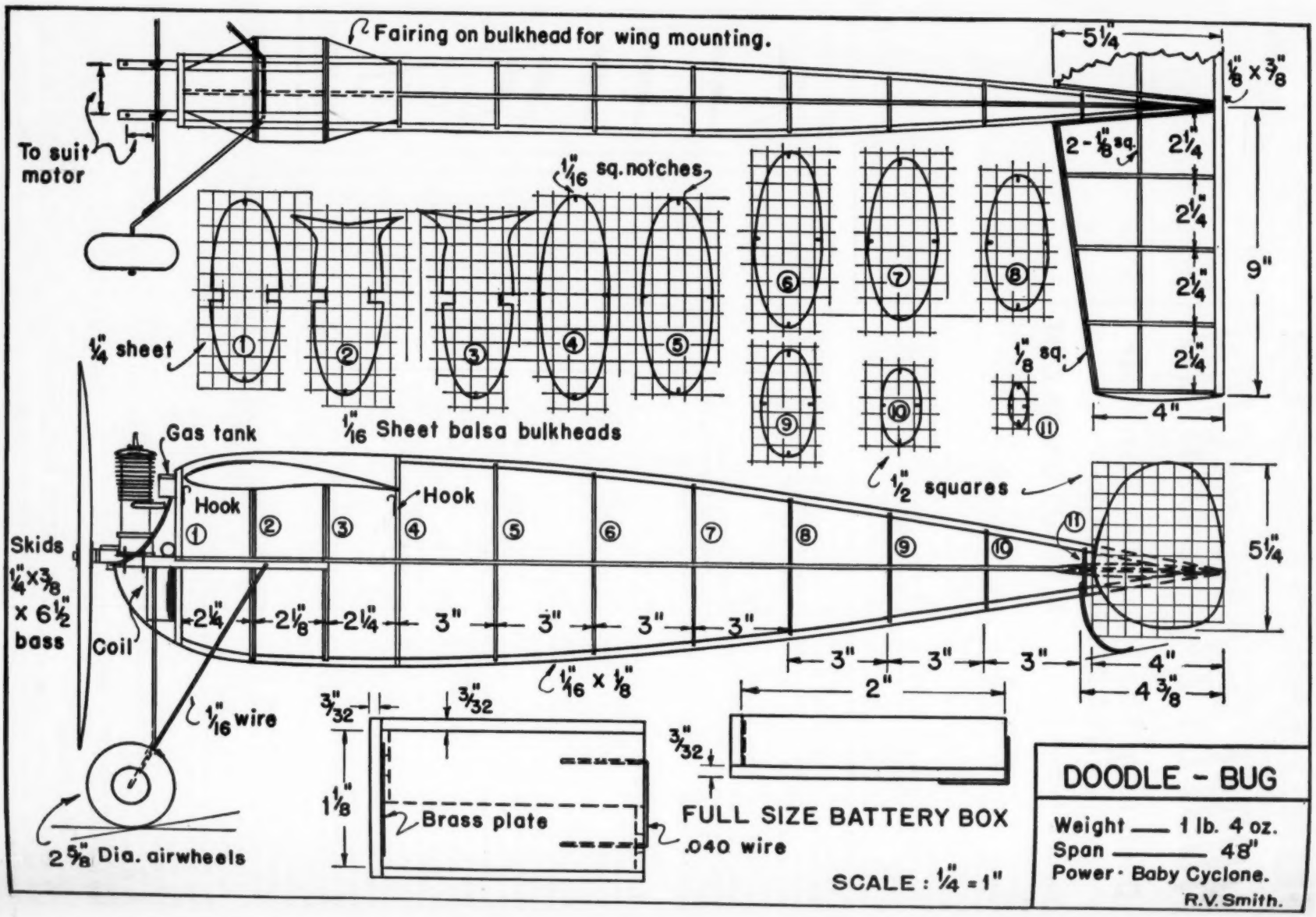
FIG. 23.

BLADE AREA TABLES (Area of one blade for various block widths, W)														
P	D	Block Width Values Shown In Top Horizontal Line.												
PITCH	DIAM.	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½
9.40	6	1.94	2.18	2.42	2.65	2.88								
10.95	7	2.27	2.55	2.82	3.10	3.39	3.67	3.96						
12.50	8	2.60	2.92	3.23	3.55	3.87	4.20	4.53	4.86	5.19				
14.05	9		3.28	3.64	4.01	4.37	4.73	5.10	5.46	5.82	6.18	6.55		
15.65	10			4.05	4.46	4.86	5.26	5.67	6.07	6.47	6.87	7.28	7.68	8.09
17.30	11				4.91	5.35	5.80	6.24	6.68	7.12	7.56	8.01	8.45	8.90
18.87	12					5.82	6.32	6.80	7.28	7.77	8.25	8.74	9.22	9.70

For Propellers Whose Block Depth, d = Block Width Divided By Two = W/2

Table Blade Area Values, $a = \left(\frac{(\sqrt{w^2 + d^2}) + d}{2}\right) 0.4\ D$ = (One Blade)

C.H.GRANT.



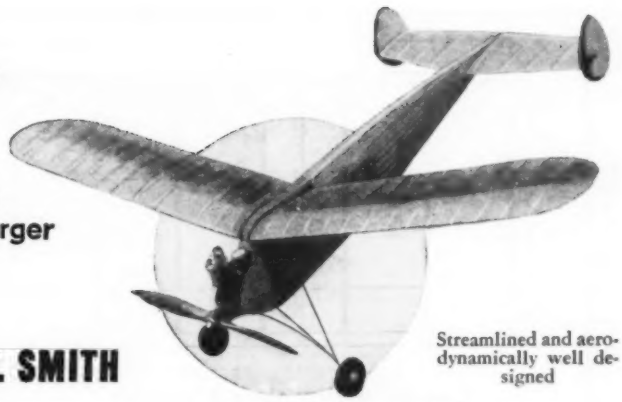
DOODLE - BUG

Weight ___ 1 lb. 4 oz.
Span _____ 48"
Power - Baby Cyclone.

R.V. Smith.

BUILDING THE "DOODLE BUG"

How to Build a Twin Rudder Four Foot Gas Model That Will Out-Perform Larger Models With Twice The Power



Streamlined and aerodynamically well designed

By **ROBERT V. SMITH**

AFTER quite a good deal of research and hard work of testing several new designs, this "DOODLEBUG" was brought forth. As you will notice, it is very streamlined and built rather light but quite strong. It was necessary to make this small model this way in order that it might better the performances of its larger brothers. The plans call for installation of a Baby Cyclone motor but an Ohlsson will allow 8-1/2 ounces per sq. ft. wing loading. Later tests with motors developing about 1/8th horsepower proved this design to be noteworthy, even with the tiny engines. The wing has an area of 2.2 sq. ft. so the minimum allowable weight is 17.6 ounces; 18.4 ounces with an Ohlsson motor.

While building this small gas model is not much harder than an outdoor fuselage model of the Wakefield type, it is generally best to start with the wing in order to get the feel of gas model construction. At any rate let's get started for this is nice weather for flying. (It must weigh 28.8 ounces when powered with a Baby Cyclone motor.)

Wing

Hard balsa is used exclusively for this structure and it should be of the best quality, especially for the spars. The 23 ribs may be cut from softer material if desired; notch them according to the full size drawing. Cut the main spars so that there will be 4-1/2" dihedral on either side of the wing. Make sure that the center is reenforced. The 1/32" sheet covering on the leading edge will also strengthen this structure and add a lot to the wing aerodynamically.

The wing is now ready to be covered and we found that a single covering of ordinary colored tissue did the trick very well, although if a little more strength is desired, bamboo paper is recommended. Two or three coats of regular gas model dope applied to the wing will finish this unit. Colored lacquer will give a fine finish and will help to beautify the ship.

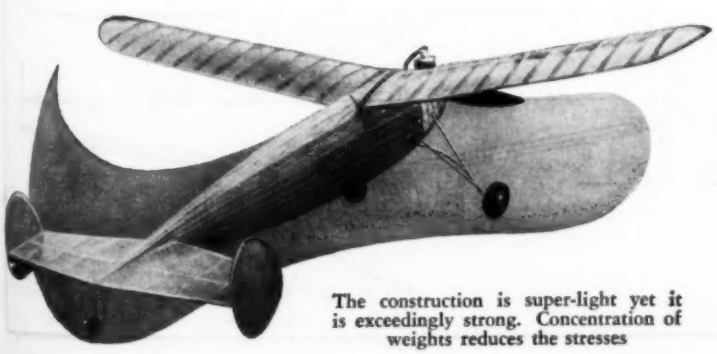
Fuselage

Although this is a very streamlined elliptical fuselage it presents no difficulties as it is made a simple way. The first step in its construction is to cut out the bulkheads. These are cut from 1/16"sheet balsa except for number one, which is from 1/4" stock. And notice too, that numbers two and three are laminated from two pieces of wood. These are notched to receive the stringers and the first three notched for the motor skids. This unit can be assembled now but make sure that the four strings are *not* flush with the bulkheads. At this stage of the game it is of vital importance that our fuselage be true; if it is warped, true it up and then cement on the bulkheads twelve more longitudinal stringers. These are put on with the 1/8" side flat on the bulkhead.

Tail Assembly

The horizontal tail surface is built integral with the fuselage. The main spar consists really of two smaller spars 1/8" square placed either side of the two main side stringers. The ribs are of the cap-strip-type and are cut from 1/16" x 1/8" balsa. Round the front edge of the leading edge and trim the trailing edge so that we'll have a symmetrical airfoil. It is a good plan to let these spars and edges extend a little beyond the end ribs so that the rudders will have a better foundation.

The twin vertical rudders are cut from soft 3/16" sheet balsa to the shape shown. After these are shaped to the outline they must be cut and sanded to a streamlined cross section. A little time and some coarse sandpaper will do this nicely. Notches in the rudders for the spars will greatly facilitate their mounting, which is done now.



The construction is super-light yet it is exceedingly strong. Concentration of weights reduces the stresses

Motor Mounting

As we said before, the original plane proved to be the best performer when powered by a "Cyclone," but different motors may be used, depending upon the builder's preferences. If a "Cyclone" is installed it is advisable to use a lighter gas tank assembly. The original model had a small adhesive tape can for its tank, the top making a fine cap, and a short piece of brass tubing was soldered in the bottom to which was attached the customary tubing to the intake at the crankshaft casing. This tank and a small coil are strapped to the front fuselage bulkhead with rubber bands. The condenser fits nicely in front of this bulkhead and holes cut where necessary serve to guide wires which go back to the batteries.

The battery box drawing is full size and is made with one end open. Two pen-cells work all right for the electrical energy. A timer may be installed if desired and for the wiring procedure, refer to the diagram. Booster jacks are left off but outside help for the batteries is used by hooking a booster clamp to the correct coil terminal and hooking the other booster clamp to some part of the motor for the ground.

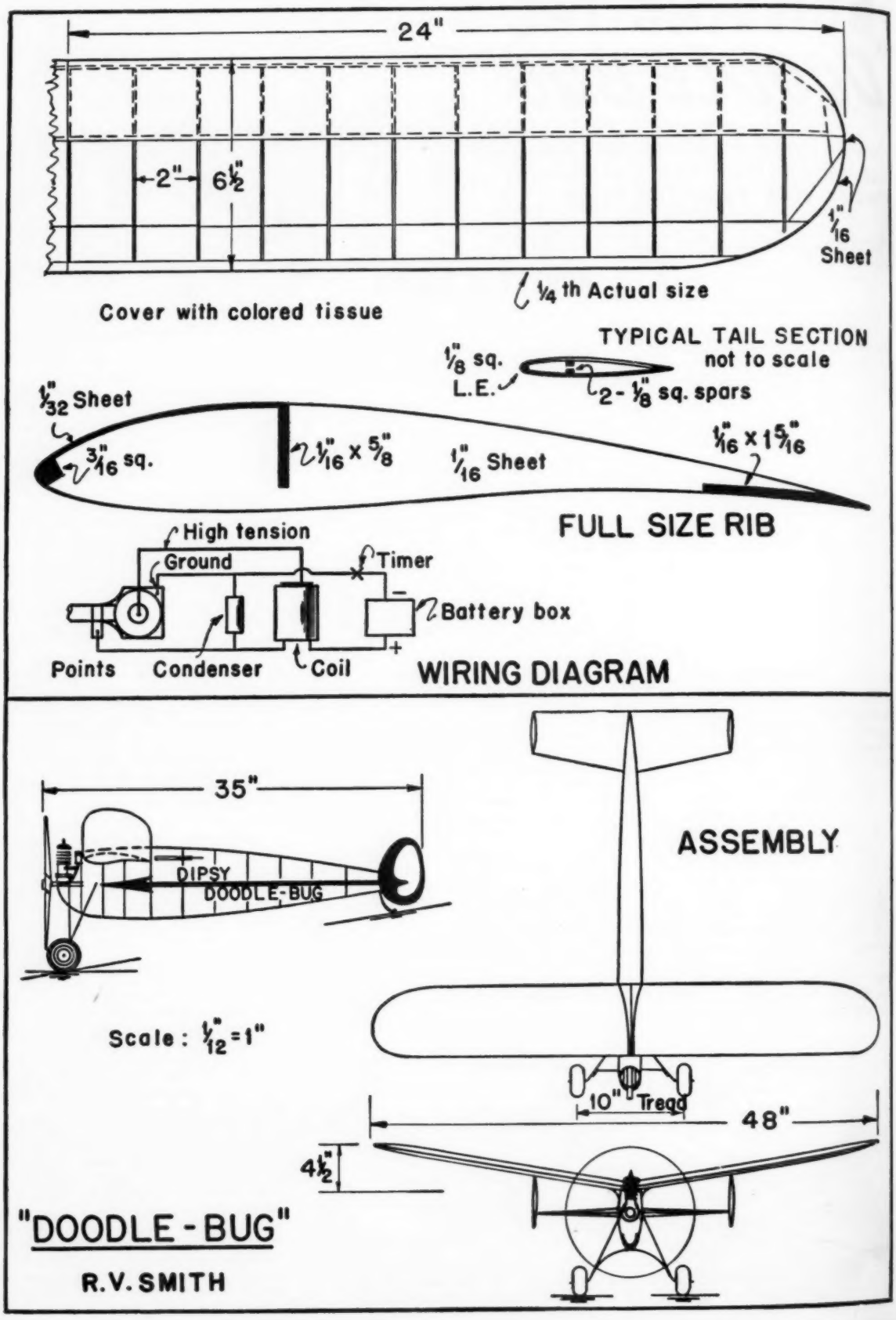
In tests it was found that the best performance took place when one degree of right-thrust and the same amount of down-thrust was given the motor setting. The battery box is adjustable in that it can be shifted around between the various bulkheads. Ordinarily it will go between numbers two and three.

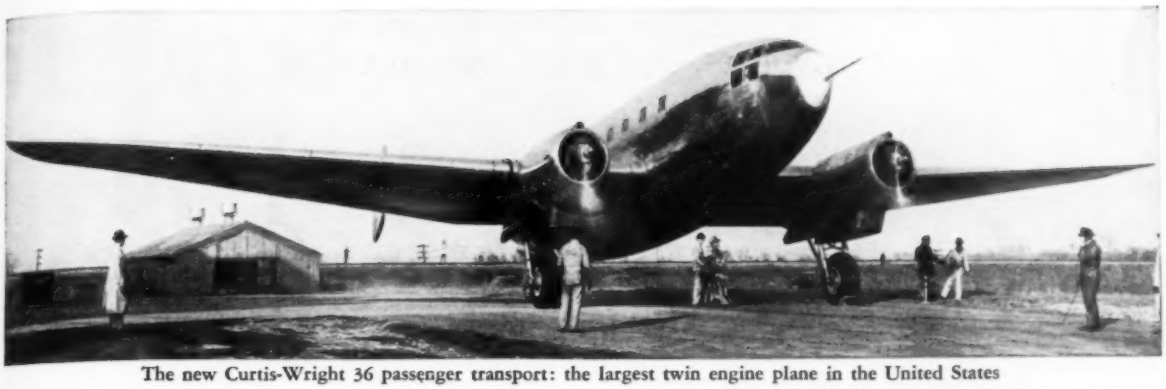
Covering And Landing Gear

The undercarriage is bent from 1/16" steel wire and the lower ends can be soldered or wrapped with wire to hold them together. The main back strut passes through the two motor skids and the front strut is tied on the skids with rubber bands. The short cross brace doesn't have to be anchored to the fuselage.

The fuselage may now be covered and like the main wing it, too, can be covered with the regular colored tissue. Some builders may prefer to plank the fuselage and if they do, it is advisable to leave off all but the four main stringers. The top of the body where the wing is placed is left uncovered so that the batteries and timer will be readily accessible. Two small wire hooks on bulkheads one and four make convenient anchoring spots for the rubber wing straps.

(Continued on page 29)


24"
2"
6½"
1/16 Sheet
¼ th Actual size
Cover with colored tissue
TYPICAL TAIL SECTION
not to scale
⅛ sq. L.E.
2 - ⅛ sq. spars
1/32 Sheet
3/16 sq.
1/16 x 5/8
1/16 Sheet
1/16 x 15/16
FULL SIZE RIB
High tension
Ground
Timer
Battery box
Points
Condenser
Coil
WIRING DIAGRAM
35"
DIPSY DOODLE-BUG
Scale : 1/12 = 1"
ASSEMBLY
10" Tread
48"
4½"
"DOODLE-BUG"
R.V. SMITH

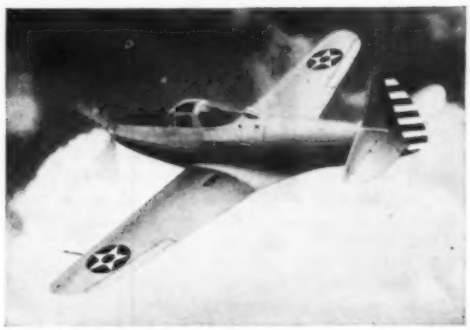


The new Curtis-Wright 36 passenger transport: the largest twin engine plane in the United States

FRONTIERS

By ROBERT C. MORRISON

THE American aircraft industry is humming now as it never hummed before! England plans to purchase 12,000 airplanes from us in the next two years; the other nations of Europe will follow suit with smaller orders. We are certainly fortunate to be prepared to meet the great demands for our warplanes, but even so the aircraft manufacturers are having more trouble cutting down their backlogs than building them up. Even the commercial domestic trade has advanced to the point where the manufacturer can build up a sizable production line from commercial orders. Probably the most important item in this aircraft boom is that our aircraft companies do not have to "freeze" their designs to obtain quantity production; their production systems are so organized that their products may be kept up-to-date at all times and new models may be shot down the production line with only a few months elapsing after their origination.



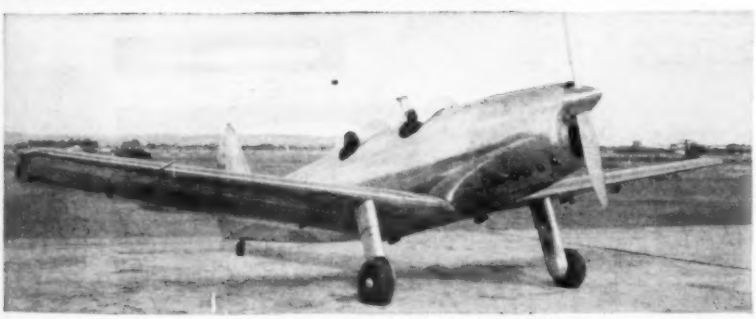
The Bell Airocobra, the U. S. Army's 400 m.p.h. pursuit plane

North American NA-50 export single seat pursuit plane

An example of this quick production on various models is North American Aviation, Inc., who has produced over fifty different models of airplanes during the company's few years of existence.

The reason new designs are not readily forthcoming from Great Britain is because they are concentrating on the designs they now have in order to manufacture them by the thousands. However we will soon see a new English single seater that will far outdo the spectacular Spitfire, which probably will be a good match for the Messerschmitts. Though single seaters, the new planes will not be interceptors, but will accompany England's bombing planes across

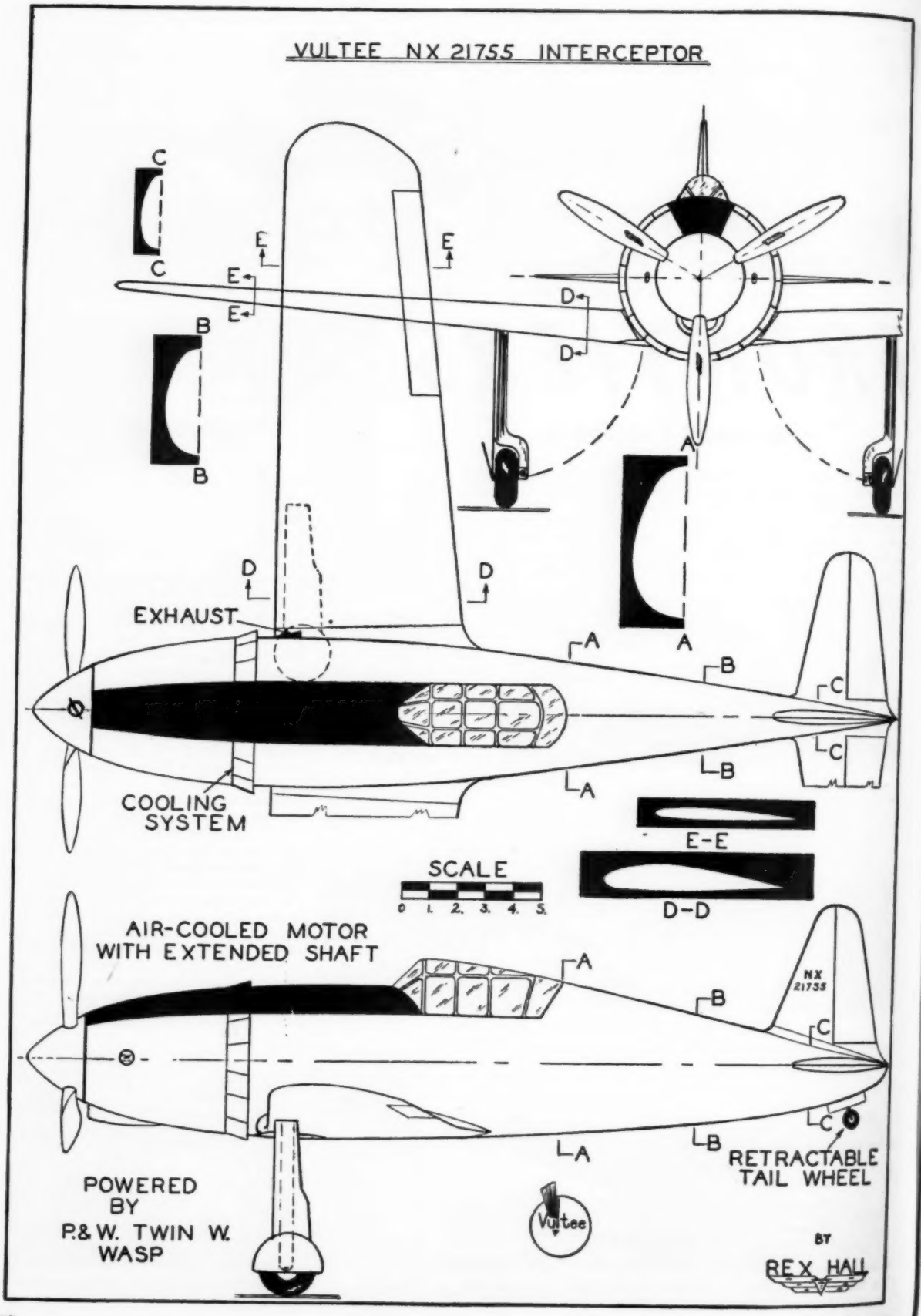
(Continued on page 42)



The North American primary training plane NA-35

The new Vought XSO2U-1 observation land plane powered with a 450 h.p. "Vee" type ranger engine

Britain's new Beaufort bomber with its crew ready to take off. Note the rear gunner's turret (British Comb.)


VULTEE NX 21755 INTERCEPTOR
C
C
E
E
E
E
B
B
D
D
A
A
D
D
EXHAUST
COOLING SYSTEM
A
B
C
B
C
A
E-E
SCALE
0 1 2 3 4 5
D-D
AIR-COOLED MOTOR WITH EXTENDED SHAFT
A
B
C
NX 21755
C
B
A
RETRACTABLE TAIL WHEEL
POWERED BY P.& W. TWIN W. WASP
Vultee
BY
REX HALL

Vanguard Of Triumph

By ROBERT McLARREN

The Vultee Vanguard high speed single seat pursuit plane

THE PLANE ON THE COVER

EVERY Chief Engineer of America's even-dozen warplane factories has a desk drawer full of designs of tomorrow. Gargantuan bombers with a six ton bomb load and a five thousand mile range, attack ships mounting twelve machine guns, fighting ships with a speed approaching five hundred miles per hour are all laid out in preliminary design form. Seversky's new six hundred mile-per-hour fighting plane, Douglas' wicked high-wing U. S. Navy scout, Curtiss' multi-gun pursuit, North American's tiny air-cooled in-line powered fighter, Consolidated, Sikorsky and Boeing's six-engine super-bomber are all in the design stage; proposal work finished, now "under consideration."

Why do these courageous leaps into the blind space of aeronautical achievement lie dormant beneath the crowded desk top of the executive engineer? Why do we wait to show the world "the latest" in American engineering design, prove to those nations now allied against the principles of freedom upon which this great land is built just what vicious, slashing fighting craft we CAN build if we were called upon to do so?

Money and courage are the foundation stones for progress. The relative proportions of these two factors lie within the power of the executive board of the aircraft factories. Some have adequate financial resources but lack the courage of their dreams. Others have an overabundance of courage—but no money!

Why do we imply that it costs a great deal of money to build a fighting plane when the total price is only around $50,000 for a medium bomber? True, these warplanes can be purchased in lots of 100 for that figure; in lots of one thousand or more for less than $35,000 apiece. But that means Ship No. 100 will cost $50,000; that Ship No. 1000 will cost only $35,000. Ship No. ONE may cost over one million dollars! Why? Let's analyze that figure. Roughly, we see a breakdown consisting of 400,000 man-hours in engineering which, at one dollar an hour, accounts for 40% of our million right there! Then jigs, dies, templates and special tooling will cost around

(Continued on page 54)

The plans and explanation given herein tell primarily how a simple practice indoor plane may be built and flown. However many beginners may find that the delicate operations involved are beyond the scope of their ability to complete properly.

In such cases, these plans may serve as a basis for a plane of sturdier structure which the novice may build as his first indoor or outdoor model; the general dimensions and outlines of both ships will be the same. In order to build the stronger version of this plane, simply make the following chances:

The wing spars should be made of 1/16" x 1/8" balsa, sanded down to 3/64" x 3/32". The ribs should be 1/16" square. The motor stick, instead of a hollow tube, should be shaped from a single balsa stick, 1/8" x 3/16". The outline of the tail surfaces should be made of the same material used for the wing spars. Cover all surfaces with light tissue paper. Make the landing gear strut of balsa, 1/8" x 1/16", tapered at the lower end to 1/16" square.

The Indoor Pioneer

By ERIC E. ERICSON

PRIMARILY in thinking of an indoor model we visualize the supreme in lightness and structural strength. This means that the model must be light, yet retain structural strength sufficient to facilitate handling ease and to take flight abuses. Therefore we must follow a definite plan based on sound aerodynamic principles.

The PIONEER incorporates features that, to this date, have never been used on any type of an indoor model. The outdoor boys will immediately recognize features they have been using to extent these past few contest seasons, for reasons other than to get aerodynamic efficiency. However, in an indoor model, where such features would tend to increase the aerodynamic efficiency of the model, no apparent effort has been made to use them to advantage.

In presenting the PIONEER to the reader the author makes no drastic claims. In calling the model "experimental" it is hoped that the reader will find the new features presented here sufficiently interesting to inspire him to incorporate them on other models in the indoor category.

Motor Stick, Tail Boom and Landing Gear

The motor stick is of 1/64" "A" stock, bent around a 1/8" metal dowel. It is a typical hollow indoor stick construction. The thrust bearing may be of dural or it can be bent from No. .012 wire. The rear hook is also of No. 012 wire. In gluing, use that glue as if it were gold; rub off the excess with your finger.

The landing gear strut is cut from 1/32" "B" stock sheet. It tapers from 1/32" x 1/16" to 1/32" square.

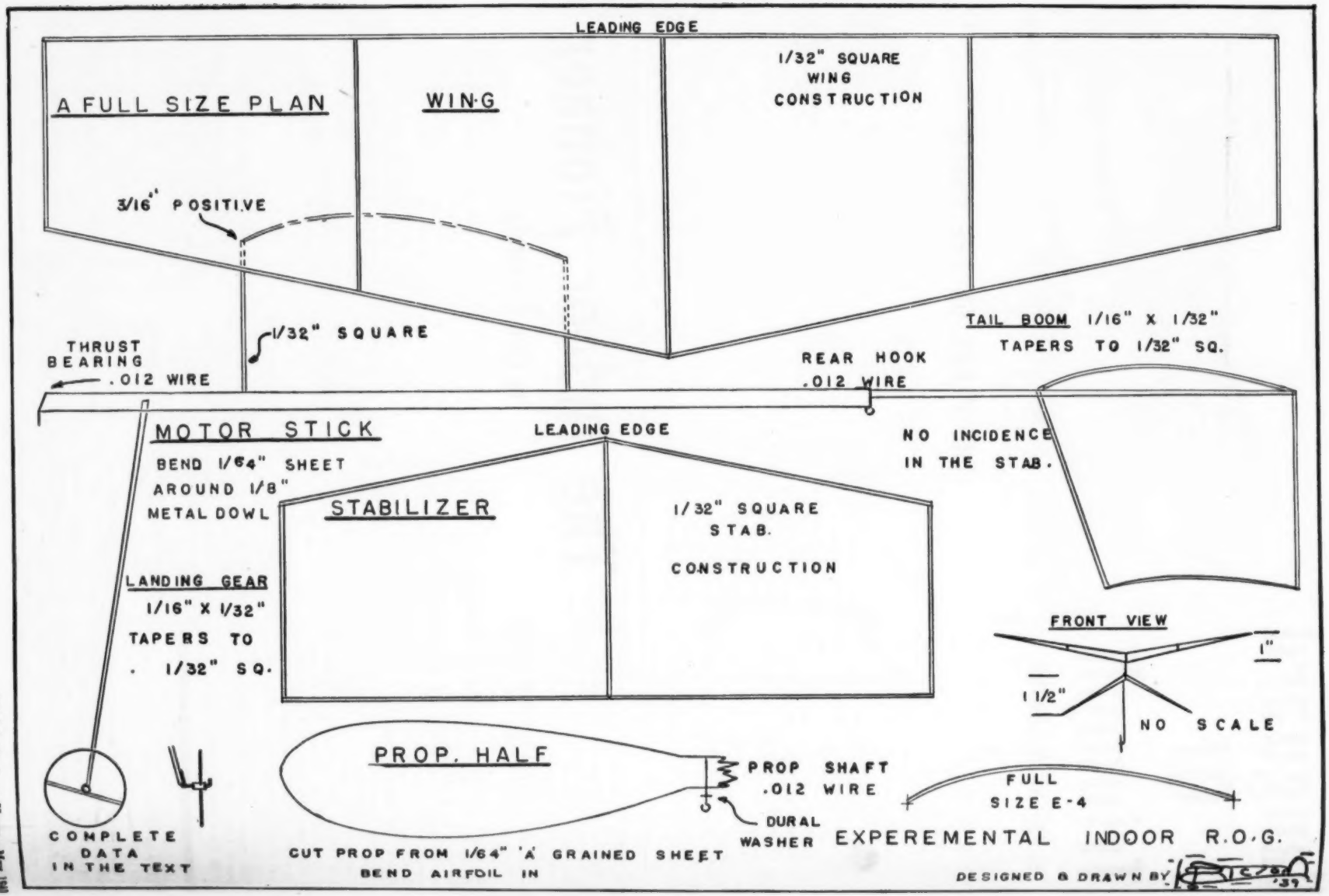
The wheel is a stiff horsehair, with a 1/32" square cross-diameter brace. A small paper tube, large enough to accommodate the wire axle, is cemented to the center of the balsa crossbrace.

The tail boom is cut the same as the L. G. strut. It is cemented to the inside of the motor stick.

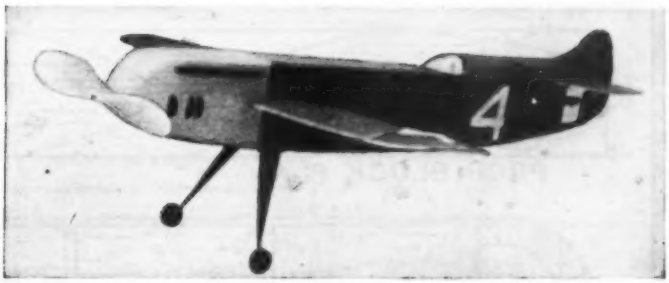
Wing and Stabilizer

The wing and stabilizer are extremely simple to make. The construction is entirely from 1/32" squares. By placing a piece of wax paper on the plan the construction may take place thereon. The 1/32" squares are of "A" stock. A full size wing and stabilizer rib are shown on the plan. Tapering the ribs is accomplished simply by removing the excessive trailing edge. The ribs are cut from "C" stock. Caution should be exercized in cementing—use the glue sparingly.

(Continued on page 60)


LEADING EDGE
A FULL SIZE PLAN
WING
1/32" SQUARE WING CONSTRUCTION
3/16" POSITIVE
1/32" SQUARE
THRUST BEARING .012 WIRE
REAR HOOK .012 WIRE
TAIL BOOM 1/16" X 1/32" TAPERS TO 1/32" SQ.
MOTOR STICK
BEND 1/64" SHEET AROUND 1/8" METAL DOWL
LEADING EDGE
NO INCIDENCE IN THE STAB.
STABILIZER
1/32" SQUARE STAB. CONSTRUCTION
LANDING GEAR 1/16" X 1/32" TAPERS TO 1/32" SQ.
FRONT VIEW
1"
1 1/2"
NO SCALE
PROP. HALF
PROP SHAFT .012 WIRE
DURAL WASHER
FULL SIZE E-4
COMPLETE DATA IN THE TEXT
CUT PROP FROM 1/64" 'A' GRAINED SHEET
BEND AIRFOIL IN
EXPEREMENTAL INDOOR R.O.G.
DESIGNED & DRAWN BY '39

A Flying Miniature Speed Winner



The completed racer is a realistic and practical flyer

Highlights of S. J. Wittman's D-12 National Air Race Winner and How You Can Build a Scale Model of It With Little Expense in a Few Hours

By ROBERT C. HARE

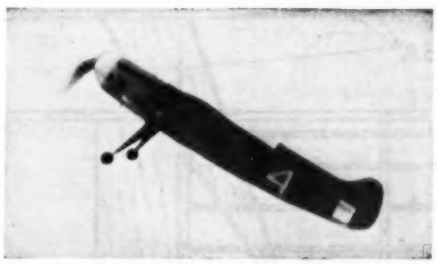
WHEN the past decade was still a youngster, one began to hear a great deal about Steve Wittman as an exponent of speed with considerable skill as both designer and pilot of racing planes.

At the time Wittman was rounding the pylons ahead of planes using several times the horsepower of his Menasco motored "Chief Oshkosh." It was hard to believe this plane capable of delivering the amazing speeds it did, if one was to judge performance by appearances. More speed was obtained in later years by wing clipping, an art at which Wittman has become very adept.

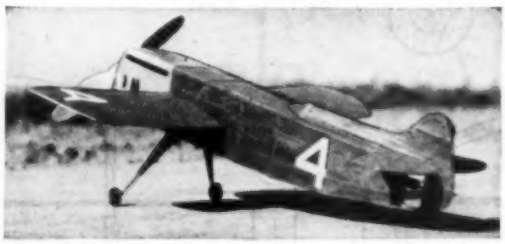
Thus it was not at all surprising when, in 1937, his new Curtiss D-12 powered racer made its debut and repeated the performance of its predecessor, again in spite of a box-like impression the new ship retained from "Chief Oshkosh." Once again Wittman had seemingly defied all laws of streamline and clean design, but competition proved otherwise. The 400 hp. D-12 job could hold its own with ships of nearly three times its power.

Such unusual qualities in an airplane seemed to be worth investigating in model form and accordingly the scale model Wittman racer described here was designed and built. As well as being surprisingly realistic, the model exceeded all expectations in flight, stability, climb and glide.

Constructing and flying this model will give a thrill to any model builder. The stubby wings have been kept true to form as has the rest of the plane, except rudder and stabilizer, which are shown with an area increase of about 30%.



Climbing steeply a few seconds after a take-off, it gives a thrilling performance



It is truly a speed model with its stubby wings and long tail moment arm

Best example of the simplicity with which Wittman has endowed this racer can be gleaned from the fuselage which should be built first. Join the two pages of full-sized plans printed here, cover with a sheet of waxed paper, and make a jig by placing pins around the longeron outlines. Longeron stock is 1/16th-inch square medium-grade balsa. Carefully cement in the upright pieces first, then finish off with the diagonals and triangular gussets as indicated.

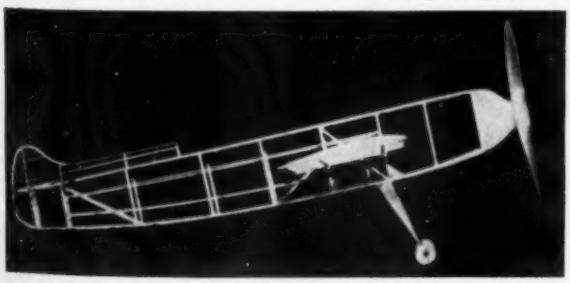
When each aside has been completed, invert the pair and cement the top and bottom cross pieces in place. The fuselage top is flat and thereby facilitates this procedure. Lastly join the sides at the tail and cement the sternpost in place. It is cut to length from 3/16th x 3/32nd-inch hard stock. Form and attach the rear hook and tail skid, shapes of which are shown in the drawings. Number 8 wire is used for these fittings.

The nose block is made up of eight 1/8th-inch medium-hard sheet balsa sections. Hollow out each section as indicated in the plans and cement them together. When dry, but still rough, cement the block to the fuselage. Make the nose plug from 1/4th-inch stock shaped as shown. To this piece cement an insert that will fit tightly in the hollow of the first lamination. The block may now be finished to its correct shape by working it with a sharp knife and sandpaper. Hold the block to a light occasionally to be sure not to break through the shell.

Two types of thrust bearings may be used in this design. The conventional flat plate type is simplest, but least efficient since it allows the prop shaft to wobble excessively and makes it difficult to correct the thrust line. This type is merely a piece of thin sheet metal drilled to take the propeller shaft and cemented to the face of the nose plug.

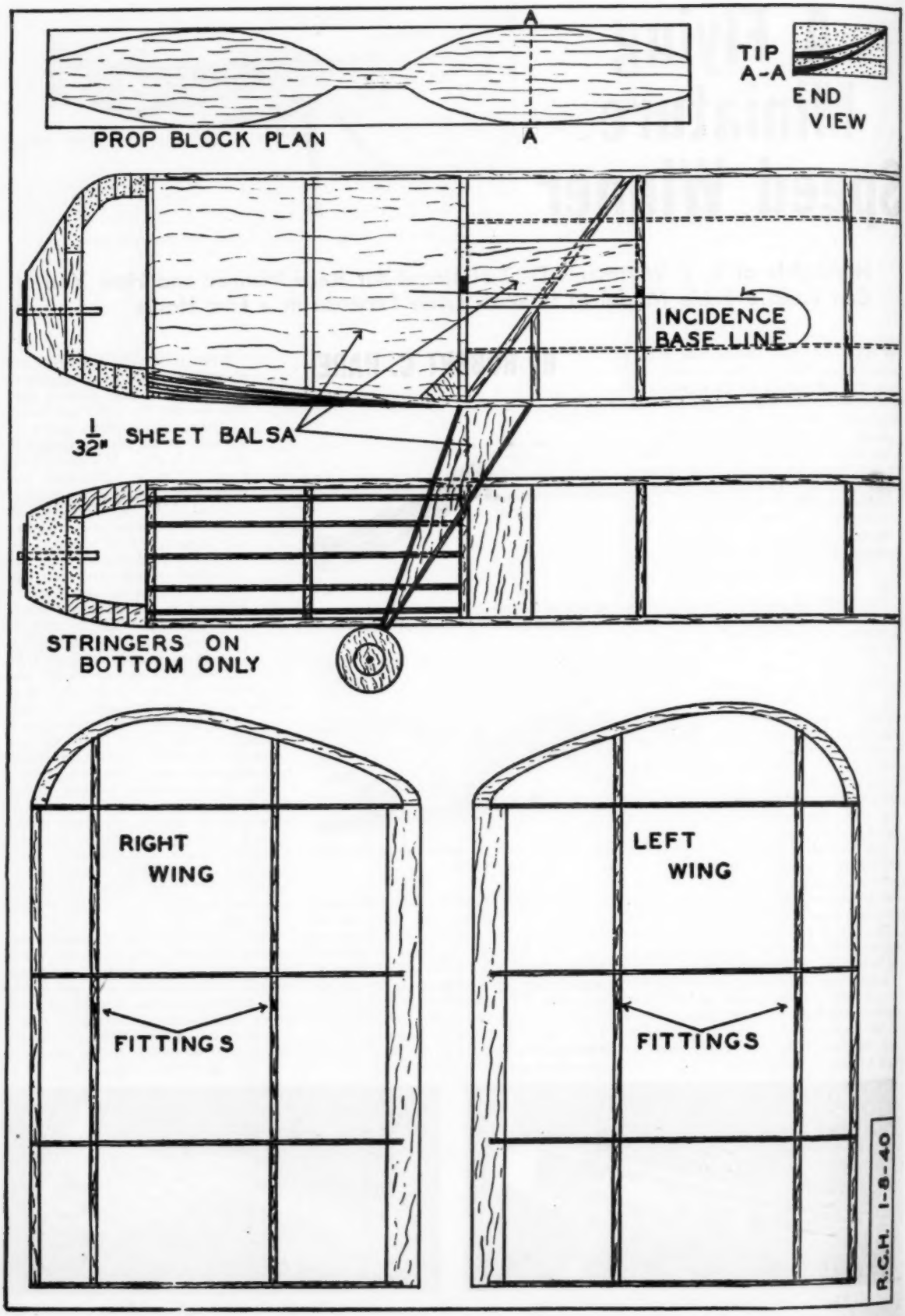
The true bearing type is naturally most efficient and with it the thrust line can be permanently set. It consists of a tube through which the shaft runs and a front plate to prevent pulling through the block. In the Wittman racer, the original bearing was made of a 5/8th-inch piece of 1/16th-inch O.D. brass tubing. A thin brass plate,

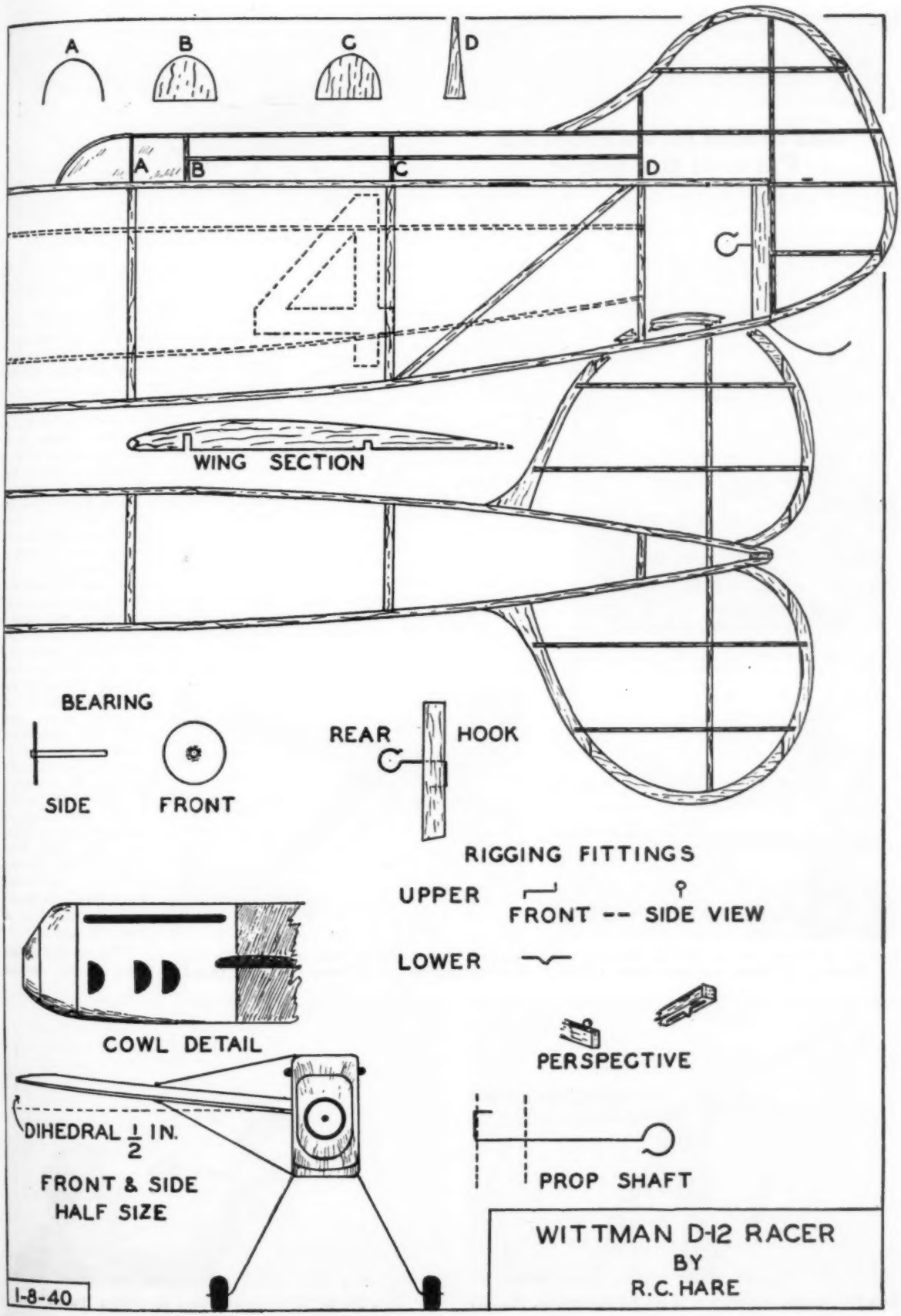
(Continued on page 40)



The fuselage structure is very simple but strong

Few parts make it light and fast


A
A
PROP BLOCK PLAN
TIP
A-A
END
VIEW
INCIDENCE
BASE LINE
1/32" SHEET BALSA
STRINGERS ON
BOTTOM ONLY
RIGHT
WING
FITTINGS
LEFT
WING
FITTINGS
R.C.H. 1-8-40

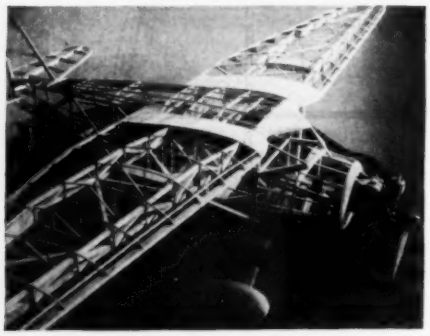

A
B
C
D
A
B
C
D
WING SECTION
BEARING
SIDE
FRONT
REAR
HOOK
RIGGING FITTINGS
UPPER
FRONT -- SIDE VIEW
LOWER
COWL DETAIL
PERSPECTIVE
DIHEDRAL 1/2 IN.
FRONT & SIDE
HALF SIZE
PROP SHAFT
WITTMAN D-12 RACER
BY
R.C. HARE
1-8-40

GAS LINES

Gas Model News From All Parts of the World

Pict. No. 1. Just a scale gas model 041A by F. Escharek

ONE of the most interesting developments in gas model building that has shown itself recently is the trend toward scale gas models. Not that contest flying has ceased to be of interest, but rather scale model builders are realizing the value of these miniature ships in working out structural or design problems that are faced by full scale airplane creators. New types of material, construction and unique ideas in design can be put into practical form and tested, with very little expense, through the medium of the gas model. In this respect it has proved to be an invaluable means of research and development. Previously full scale planes had to be built and tested in order to determine the value of any particular feature of design or construction. Now it is a case of "trying it out on your gas job."



Pict. No. 4. Build this and you will know how an airplane is made. A scale Stinson before covering

Several interesting examples of planes illustrating this point have come to us this month. One of them is shown in picture No. 1. Here you see a gas model Douglas 041A constructed by Fred Escharek of 600 Bangs Avenue, Asbury Park, N. J. You will note that the scale features of the model are carried out carefully; even great care has been taken to cowl the motor to conform with the appearance of the full scale ship. About the same dihedral is used, or, if not, very little more than the large craft. The parasol type plane, of course, makes it unnecessary to use excessive dihedral. The little ship has a wing span of 50 inches and weighs 2 1/4 pounds. It is entirely covered with silk and is powered with an Ohlsson "23". Mr. Escharek says:

"Due to the fact that it is slightly overweight it is a snappy flyer and lands 'hot.' The plane flies well and has had only one serious crack-up, due to improper adjustment and not design."

Another interesting scale gas job comes from our old friend, Ken Willard of Parks Air College, East St. Louis, Illinois. It is a Waco custom cabin plane, shown in picture No. 2. Mr. Willard is noted for his precision and care in design and construction and this little ship is an excellent illustration of his work. He says he has been working on the model during his spare time and estimates that it required over 450 man-hours to complete. The ship is exactly to scale throughout with the minor exception of placing the landing gear slightly forward. The wings, tail, engine and cowl are demountable and can be assembled or dissembled in five or six minutes. It is designed to fly; each wing panel being held in place by rubber attachments and if a crash occurs they come off rather than crack up. The landing gear is fully shock absorbing. The ship has a 5 foot span, weighs 2 1/2 pounds and is powered with an Ohlsson "23." The wing loading is approximately 8 ounces per square foot, which is extremely light for this type of ship. Willard says:

"This model is my answer to the present

Pict. No. 9. George Ivey Jr. flew this all-metal fuselage plane at the Miami seaplane contest. (Kulick)

Pict. No. 7, Bob Hayes' "one wheeler" with wing slots to prevent stalls when climbing. (Kulik)

Pict. No. 10. Kurt Stevenson with his 9½ ft. seaplane. (Kulick)

Pict. No. 8. Phil Sagona exhibits his unique "pusher"

Pict. No. 2. Ken Willard's scale Waco has all the details

Pict. No. 3. Not a World War plane but Carlyle Linski's model

trend of competitive modeling—overpowered ships (even under the new rules) that shoot almost vertically into the air. I personally prefer to see model airplanes that look like big ones (aside from their aerodynamic necessities, will anyone contend that contest models of today look like full scale airplanes?) and perform like them. The take-off run with the tail lifting, flying speed being attained, then a smooth climb into the air—those are the things I like to see."

Mr. Willard at present is faculty adviser to the Parks Aero Club at the college. They held their first model contest of the season in March, under regular N.A.A. rules.

Now we come to another type of gas job; model builders are not confining their efforts to modern ships. Picture No. 3 shows a FE2-B, a model of an old wartime plane, built by Carlyle Linski of Dallas, Texas. It is of the pusher type and in order to be assured of complete stability the dihedral of the wings has been increased considerably. It is an extremely interesting ship and makes a striking appearance in the air. We are indebted for this photo to John E. Clemens of P. O. Box 2063, Dallas, Texas; a very well known member of the Dallas Gas Model Club. This club is affiliated with the Southwest Gas Model Association, which is made up of about thirty major clubs and is one of the strongest groups in the country.

Pict. No. 5. Ervin Leihy and his 11-foot tailless gas job. The plane weighs 9 pounds

Pict. No. 6. Giving motors their final test at the Bunch Motors Co. factory.

If you wish to see a fine illustration of how new ideas in structural details may be worked out, look at picture No. 4. This is a scale model Stinson. Unfortunately the letter in which this picture was

(Continued on page 29)

MODEL AIRPLANE NEWS - MODEL AIRPLANE ENGINE DIRECTORY FOR 1940 CONTINUED.

NAME	CLASS	WEIGHT IN OZS. * BARE	WEIGHT IN OZS. ** FLYING	DISPLACEMENT IN CUBIC INS.	BORE	STROKE	CYCLE	PORTS	RATED H.P.	R. P. M. MIN.	R. P. M. MAX.	FUEL PARTS GAS WHITE	FUEL PARTS OIL SAE-70	PROPELLER DIA.	PROPELLER PITCH	MOUNT	BLOCK TESTED	TYPE OF GAS FEED	INVERTIBLE	MINIMUM WEIGHT OF PLANE IN. OZS
BLOWNIE "E"	B	5½		.291	.770"	.625"	2	3	1/12	900	8000	3	1	10"-12"	6"-7"	BEAM	YES	SUCTION	YES	23.30
BULLET (HI-SPEED)	B	3½	8	.276	25/32	5/8	2	2	1/17	300	6500	2½	1	11"	6½	BEAM	YES	SUCTION	YES	22.10
CYCLONE-SUPER	C	7¼	20	.647	15/16	15/16	2	2 ROTARY VALVE	1/8 TO 1/6	1000	7300	3	1	13"-14"	6"-8"	BEAM	YES	SUCTION	YES	51.80
DRAGON	B	6½	11	.211	5/8"	11/16"	2	2	1/17	500	6500	4	1	10"	6"	BEAM	YES	SUCTION	YES	16.90
DEMON	A	3½	8	.152	9/16	5/8	2		1/20	250	12500	3	1	10"-12"	6"-7"	BEAM	YES	SUCTION	YES	12.70
FEENEY "A"	C	15	24	1.18	1 3/16	1 5/16	4	OVERHEAD VALVES	1/3	300	9000	80-90 OCTANE	STRAIGHT	18"	8"	RADIAL	YES	SUCTION	YES	94.40
FEENEY "B"	C	13½	22½	.914	1 1/16	1 1/16	4	OVERHEAD VALVES	1/4	300	9000	80-90 OCTANE	STRAIGHT	15"	6"	RADIAL	YES	SUCTION	YES	73.10
FEENEY "C"	C	12	21	.617	15/16"	7/8"	4	OVERHEAD VALVES	1/3	300	9000	80-90 OCTANE	STRAIGHT	12"	6"	RADIAL	YES	SUCTION	YES	49.40
FORSTER-SUPER-"99"	C	15	25	.997	1 5/16	1 5/16	2	4	1/8	AT	6000	10	1	18" 16" 15"	6" 8" 10"	BEAM	YES	SUCTION	YES	79.80
MEGOW	A	3	6½	.192	.625"	.625"	2	4	1/8	400	9000	4	1	9"	6"	BEAM	YES	SUCTION	YES	15.40
MADEWELL	A	4	8	.140	9/16	9/16	2	4	1/8	TO	4500+	3	1	9"	6"	BEAM	YES	SUCTION	YES	11.20
MAY	C	7	12½	.454	13/16	7/8	2	2	1/8	600	12000	3	1	13"	6"	BEAM	YES	SUCTION	YES	36.30
MINIATURE	A	2	4½	.104	33/64	1/2	2	2	1/12	300	3500	4	1	10"	8"	BEAM	YES	SUCTION	YES	83.20
OHLSSON "19"	A	3½	8½	.197	11/16	11/16	2	3	1/7	500	7000	3	1	9"-10"	5"	BEAM-RADIAL	YES	SUCTION	YES	15.80
OHLSSON "60"	C	10	19½	.617	15/16	7/8	2	3	1/6+	500	7500	3	1	14"-15"	10"	BEAM-RADIAL	YES	SUCTION	YES	49.40
O.K. TWIN	C	18	33½	1.209	.900"	.950"	2	3	1/7	500	5500	4	1	18"-20"	10"-12"	RADIAL	YES	GRAVITY	NO	96.70
O.K. DE LUXE	C	7¼	18	.616	.900"	31/32"	2	3	1/8+	500	10000	3½	1	14"-15"	8½-10	BEAM-RADIAL	YES	SUCTION	YES	49.30
O.K. STANDARD	C	7¼	18½	.604	.900"	.950"	2	3	1/8+	500	10000	3½	1	14"-15"	8½-10	BEAM-RADIAL	YES	SUCTION	YES	48.30
O.K. SPECIAL	C	7¼	18	.604	.900"	.950"	2	3	1/8+	500	10000	3½	1	14"-15"	8½-10	BEAM-RADIAL	YES	SUCTION	YES	48.30
RANGER	B	3½	7½	.292	.690"	.782"	2	4	1/8	230	18750	4	1SAE-90	13"-14"	6"-7"	BEAM	YES	SUCTION	YES	23.40
SKY CHIEF	C	10	14	.526	7/8	7/8	2	4	1/6+	1800	15000	4	1	13"-14"	7"-8"	BEAM	YES	SUCTION	YES	42.10
CHAMPION	C	10	21	.600	.925"	.900"	2	2 ROTARY VALVE	1/6+	500	12000	2½	1	13"-16"	8"	BEAM	YES	OPTIONAL		48.00

CORRECTIONS - (OTHER PERTINENT FIGURES PUBLISHED IN MARCH 1940 ISSUE OF M. A. N.)

AVION MERCURY	C	19½	28																YES	
BROWN "D"																	YES		YES	
BELMONT																	YES		YES	
BUNCH MIDGET																	YES		YES	
GWIN-AERO																	YES		YES	
HURLEMAN																			YES	36.80
KAYDET																			YES	13.10
OHLSSON "23"				.232	29/32	5/8		3	1/6	500	7500	3	1	10"-11"	6"				YES	18.40
PHANTOM "8"	B																		YES	
REBEL	B																		YES	
TROJAN	B																		YES	
TORPEDO	B			.299	.725	.724													YES	23.90

* DEFINITIONS:

* BARE WEIGHT OF AN ENGINE IS ITS CYLINDER, CRANKCASE HOUSING AND ALL COMPONENT PARTS INTERNALLY OR EXTERNALLY ATTACHED INCLUDING UNFILLED GAS TANK AND SPARK PLUG.

** FLYING WEIGHT OF AN ENGINE IS THE TOTAL WEIGHT WITH GAS TANK, COIL, CONDENSER WITH LEADS TO PLUG AND GROUND ATTACHED, AS WELL AS A SET OF BATTERIES NORMALLY REQUIRED TO SUPPLY THE VOLTAGE AS SPECIFIED BY ENGINE MANUFACTURER. IT DOES NOT INCLUDE THE METAL OR WOODEN MOUNT IN THE SHIP, PROPELLER OR BATTERY CASE

** ALL FLYING WEIGHT FIGURES INCLUDE TWO 1½ VOLT REGULATION BATTERIES. EVEREADY-LARGE SIZE-D-WEIGH 6 OZ. PER PAIR; MEDIUM SIZE-C-WEIGH 3¼ OZ PER PAIR; PENCIL SIZE-AA-WEIGH 1½ OZ. PER PAIR. BRIGHT STAR, BURGESS, MERIT, WILLARD AND OTHERS WEIGH APPROXIMATELY THE SAME

MANUFACTURERS' FIGURES FOR BORE AND STROKE HAVE BEEN USED TO CALCULATE THE PISTON DISPLACEMENT BY MEANS OF THE FORMULA:-

$Cu = (0.7854) B^2 S. N.$ IN WHICH B = BORE; S = STROKE AND N = NUMBER OF CYLINDERS.

Drawn by H.G. Hamson. Jesse Davidson

Designing Gas Models For Performance

A Simple Method of Calculating the Minimum Sinking Speed and the Maximum L/D of Your Airplane

CORRECTION

In article No. 1, in the March 1940 issue of MODEL AIRPLANE NEWS, on page 21, step No. 2, there is an error in the sample determination of f, the parasite factor. The parasite coefficient, read from curve 3 of Fig. 1, should be 0.024 instead of 0.24, and the parasite factor, determined from the multiplication 0.024 x 8 should be 0.192 and not 0.208 as stated.

This error causes the parasite loading to be 36.5 instead of 33.7, and will change the General Loading Factor, L, to 5.15. From studying Figs. 4 and 5, it will be seen that the effect of this change on the top speed, rate of climb, and speed at maximum rate of climb is extremely small.

The charts themselves are entirely correct, and the sample calculation may be followed, using the three loadings as first determined: l_s = 0.108, l_p = 33.7 and l_t = 44.8.

IN ARTICLE No. 1, last month, we discussed a method for determining the maximum speed, maximum rate of climb and velocity at maximum rate of climb for any gas model, providing the specifications of the model were known. In this article the rest of the performance of the gas model will be discussed. To be determined are the minimum sinking speed, maximum L/D and the model's speed for these two conditions.

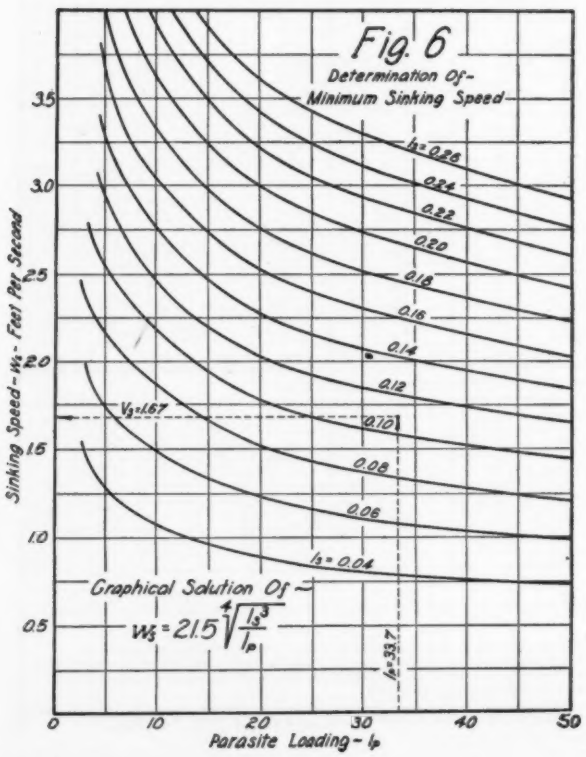
These four are determined very easily from three charts, without calculation of any type. The three charts, Figs. 6—8, are very similar in character and read in the matter of a few seconds.

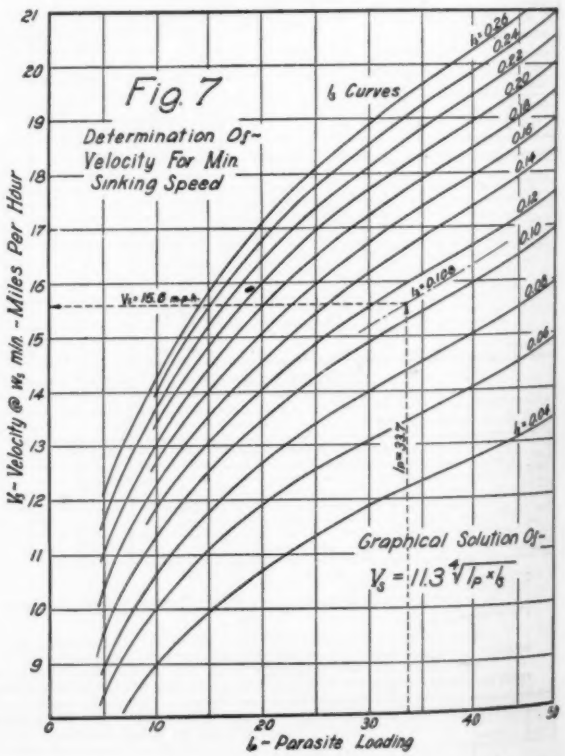
It will be recalled that last month we determined the performance of a sample model by calculating three loadings, the span loading, l_s, the power loading, l_t and the parasite loading, l_p. From these three loadings a general loading factor, L, for the whole model was determined. This is very similar in nature to the flight coefficient employed by Mr. Charles H. Grant in his performance analysis, but is based upon theoretical grounds rather than empirical data. In other words, this analysis is developed directly from the theories used in the design of full-scale aircraft and remains unaltered by the author's personal opinion. It will be seen shortly how the results compare with experimental results.

Since this month we are determining performance qualities of the model with power off, common sense would tell us that the power loading, l_t, would have no bearing on the analysis. This, of course, is borne out by the theory. To determine any of the qualities of the gliding flight, only l_p and l_s, the parasite and span loadings respectively, are required.

Consider what this means: It immediately follows that the sinking speed, gliding angle (or L/D) and the velocities of the model at these two conditions are functions only of two numbers, l_p and l_s, which are determined in a few minutes from the specifications of the model. This renders so-called "scientific analysis" ridiculously easy.

In Fig. 6 we determine the minimum sinking speed of any gas model. It will be recalled that the sample model chosen to demonstrate the method of procedure was the "Aristocrat," designed by this writer and described in the February, 1937 MODEL AIRPLANE NEWS. From the specifications of this model, l_p, the parasite loading was determined as 33.7 and l_s, the span loading was equal to 0.108. Incidentally, to those who may be interested, both these loadings are in pounds per square foot. However, all the model builder need do is to use the charts to determine the performance of his model, paying no heed to units, since everything has previously been worked out on the charts. The simple formulas for determining the loadings, l_p, l_s and l_t, were





Part 2
By LEO WEISS

Specification	Units	Symbol	Formula	Chart	Sample Model	W=5# b=7'	W=5# b=9'	W=5# b=10'	W=4# b=10'
Power Loading	lb/h.p.	l_t	$l_t = \frac{W}{\eta \times h.p.}$	—	44.8	32.0	32.0	32.0	25.6
Span Loading	lb/sq.ft.	l_s	$l_s = \frac{W}{e \times b^2}$	—	0.108	0.116	0.077	0.066	0.053
Parasite Loading	lb/sq.ft.	l_p	$l_p = \frac{W}{f}$	—	33.7	24.2	24.2	24.2	19.4
Loading Factor	——	L	$L = l_s \sqrt[3]{\frac{l_t^4}{l_p}}$	Fig.3	5.3	4.1	2.7	2.3	1.5
Aspect Ratio	——	A.R	$A.R = \frac{b^2}{S}$	—	10	6	10	12.5	12.5
Maximum Speed	mi/hr.	V_m	——	Fig.5	47.6	47.9	48.0	48.7	48.8
Max. Rate Of Climb	ft/min.	C_h	——	Fig.4	350	501	515	522	637
Speed @ Max. C_h	mi/hr.	V_c	$V_c = R_v V_m$	Fig.4	26.2	26.1	26.7	26.0	25.7
Min. Sinking Speed	ft./sec.	w_s	$w_s = 21.5 \sqrt[4]{\frac{l_s^3}{l_p}}$	Fig.6	1.67	1.87	1.38	1.25	1.12
Speed @ Min. W_s	mi/hr.	V_s	$V_s = 11.3 \sqrt[4]{l_p l_s}$	Fig.7	15.6	14.7	13.2	12.7	11.4
Maximum L/D	——	L/D	$L/D = 0.89 \sqrt{\frac{l_p}{l_s}}$	Fig.8	15.7	13.1	15.8	17.3	17.4
Duration With Timer	min.	T	$T = 30 + \frac{C_h}{2W_s}$	——	2:15	2:44	3:38	4:00	5:15

Fig. 9

given last month.

The minimum sinking speed, as stated before, is a function of l_s and l_p and therefore can be expressed in a formula. This formula, however, is of such complicated nature that to actually solve for w_s, the minimum sinking speed, would be a job requiring either a slide rule or the use of logarithms without entailing a lot of pencil work. The formula is: $w_s = 21.5 \sqrt[4]{\frac{l_s^3}{l_p}}$. Therefore, since it would require so much work to solve this formula, a chart, Fig. 6, was developed so that the result can be read accurately in a few seconds. The dotted lines on the chart show how reading is done. At l_p for your gas model (33.7 for the Aristocrat), draw a vertical line upward to where it crosses the proper l_s curve for your model. As seen in Fig. 6, there is no l_s curve for exactly 0.108, but the curve may be very closely approximated between the two curves for l_s, equalling 0.10 and 0.12. At this intersection the line is carried over horizontally to the scale on the left, where the minimum sinking speed, w_s, is read without further ado.

For the sample model, w_s is read as 1.67 feet per second, which means that with very careful adjustment it should be possible to sink at a minimum rate of 1.67 feet per second. Later on we will check on this.

After finding the minimum sinking speed, it would be interesting to determine at what forward speed of the model this occurs. Naturally, the minimum sinking speed occurs at a certain speed of the model and ONLY at that speed. If the model flies at a higher speed by decreasing the angle of attack on the wing, it will sink faster in spite of the fact that the gliding angle is increased, because the model is going so much faster. Decreasing the speed of the model also increases the rate of descent; this time because the gliding angle of the model has increased more than the airspeed has decreased. So it is that there is only one velocity for each model at which the sinking speed is a minimum. When the model is gliding at that airspeed, then the sinking speed must be at a minimum.

The airspeed for minimum sinking speed is determined from Fig. 7. Reading this chart is accomplished just as easily and in the same short time as Fig. 6. The formula for the velocity at minimum sinking speed is: $V_s = 11.3 \sqrt[4]{l_p l_s}$.

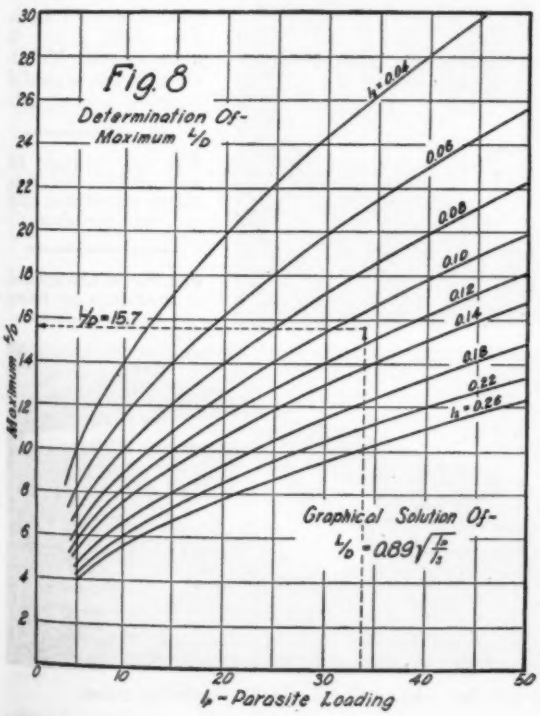
This formula is not nearly as complicated or difficult as the formula for w_s, the actual sinking speed, but it would still take at least fifteen minutes to get an answer, whereas the chart gives the answer almost immediately. At l_p = 33.7, going vertically to l_s = 0.108, and then horizontal to the scale on the left, the airspeed at minimum sinking speed is read as 15.6 miles per hour, for the Aristocrat.

Looking back to article No. 1, we find that V_c, the airspeed for maximum rate of climb, was determined as 26.2 miles per hour. Under ideal adjustment, therefore, the Aristocrat should climb with its motor on at a speed of 26.2 m.p.h. and then, when the motor cuts, it should glide more than ten m.p.h. slower, at 15.6 m.p.h. These facts are of prime importance in determining the correct settings for wing, thrust line, c.g., tail incidence, etc.

Oftimes in the past, model builders have come forth with weird stories about the gliding angles of their models. Now it can be seen from logic alone that gliding angle is not the sole factor affecting the sinking speed of the model, since the airspeed has great effect on the sinking speed, as explained before. However, it is highly improper to theorize that since a low sinking speed depends upon a low airspeed, then the airspeed should be decreased as much as possible. There are two objections to this. First, since the wing loading of the models can be decreased no less than eight ounces per square foot, the speed can be decreased only by piling on drag, which has more effect on gliding angle than airspeed. The second reason is that when airspeeds get too low, scale effect becomes important, since the model gets into the low speed class, increasing the drag tremendously.

It is important, therefore, to increase the L/D as much as possible, since it is, in effect, a measure of the overall efficiency of the model, since it indicates how much lift is obtainable with a certain amount of drag. The actual value of the L/D and the speed at which it occurs, V_{LD}, has no particular significance in performance analysis of models except in indicating how efficient the design is.

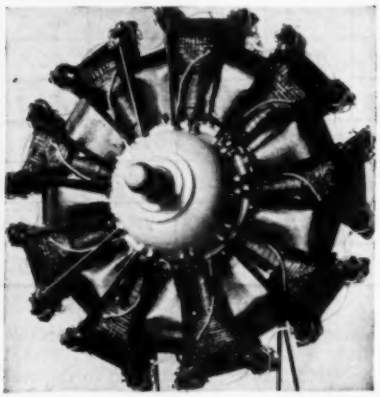
(Continued on page 50)



Pict. No. 1. A Bristol Fighter, 9¾ in. scale model by Geo. H. Dieter Jr.

Air Ways

What Air Ways Club Members Are Doing Throughout the World to Increase Their Aviation Knowledge



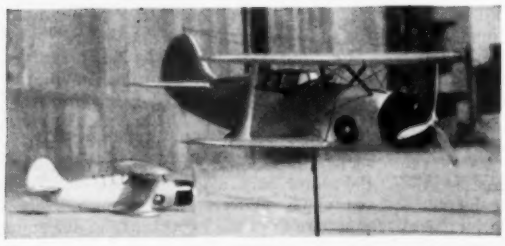
Pict. No. 5. 400 separate pieces are in this engine built by Donald Armstrong

MODEL builders' technique has taken a variety of forms during the past month. Apparently keen minds never cease to think up new tricks and gadgets in respect to model airplane designing and building; consequently we have an interesting number of things to tell you about this month. A number of our readers evidently are still interested in World War types of planes. These ships have made a vital link in the chain of aeronautical development; therefore model builders should be familiar with them as well as with the modern ones.

In picture No. 1 is shown an exact scale Bristol F-26 which has a span of only 9-3/4 inches, though the extreme detail makes this little ship appear much larger than it really is. George H. Dieter Jr. of 2500 Wheat Street, Columbia, S.C., has been kind enough to send it to us and he says it was built by his friend, John Symonds of 75 Norfolk Road, Ipswich, Suffolk, England.

One of the problems in building scale models of the older type is putting in the guy wires so that they are realistic. This is probably the most difficult operation in model building and Symonds deserves a lot of credit for his model is an excellent piece of work, especially in this respect.

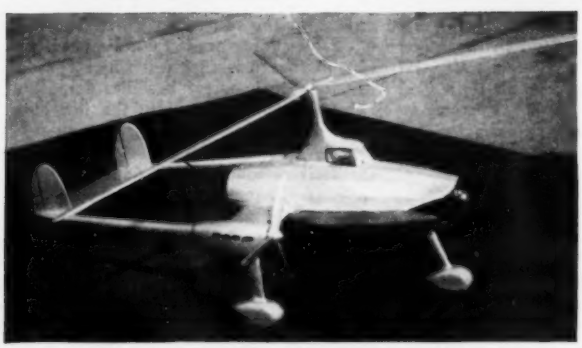
Many of our old readers will recall Roger F. Parkhill, who is now at the Base Headquarters and 20th Air Base Squadron, Nichols Field, Rizal, Philippine Islands. He sent us picture No. 2, showing a Boeing P-12, constructed by his thirteen-year-old friend, Robin McPherson of 3400 East Colfax Avenue, Denver, Colorado. The model is only 12 inches in span. McPherson may well be proud of his work, especially as he

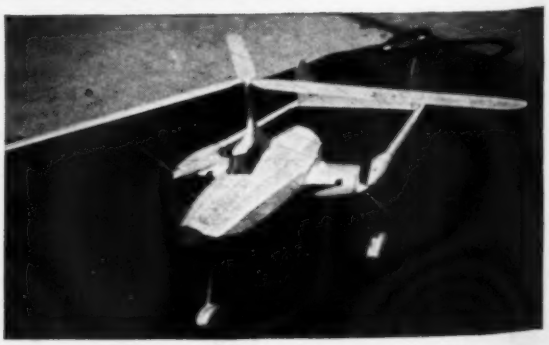


Pict. No. 6. Curtiss U.S. Navy fighters, creations of Moriichi Kitamura, Japan

Pict. No. 7. (Left) Edward Soltis, deaf mute, enjoys his aviation study and workshop

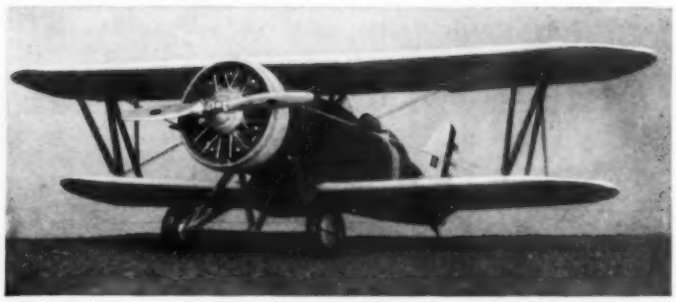
Pict. No. 8. Chicago model instructors are trained in special classes





Pict. No. 9 and No. 10. A cleverly designed scale model autogiro, winner of this month's originality contest

Pict. No. 3. Two years of work by Jim Wilson



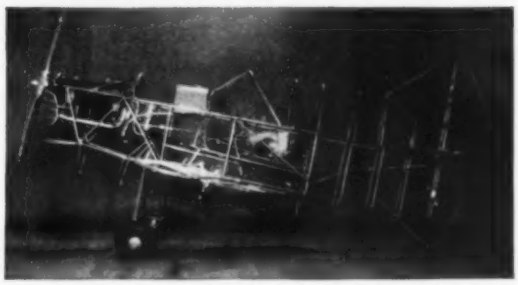
Pict. No. 2. 13-year-old Robin McPherson built this Boeing P-12

has only a few years weighing on his shoulders. Examination of the engine and propeller indicates very fine craftsmanship of which expert model builders with years of experience might be proud. The model has workable controls and has a carefully applied finish in regulation U. S. Army Air Corps colors. The fuselage is built-up and covered with sheet balsa, the surfaces with Jap tissue.

In picture No. 3 we see a Seversky P-35 pursuit built by Jim Wilson of 5737 North Kent Avenue, Whitefish Bay, Wisconsin. It took about two years to complete this ship, which has just recently been finished. Apparently everything works on the model; the controls can be moved from the cockpit, navigation lights function normally, the beam from the landing lights is extremely light and can be seen on a wall 50 feet away, the instrument panel is complete and is illuminated. Even the baggage opening has a small catch on the door which is illuminated with a tiny light bulb. Power for the lights is supplied by three batteries in the base of a removable stand. Other details include upholstery, detailed safety belt, scale radio set and tiny earphones, 14-cylinder engine built to scale which mounts a variable pitch prop, carved from wood. Oh, yes, we must not forget the landing gear which is retractable and the wheels which are pneumatic. Despite all this equipment the ship weighs less than a pound. The cowl, cylinders and stand of the model were turned down on a lathe. The only parts which were bought were the front wheels, lights and cardboard insignia. About the only things that Wilson hasn't made on this ship are the paint and silk; we believe he bought these. This is one of the most remarkable pieces of work ever submitted to us.

Another unusual piece of work is shown in picture No. 4. It is the framework of a detailed scale model out of brass tubing, and was built by Joe Hyland of 1114 8th Avenue, North Fargo, N.D. It embodies all details, including movable controls and throttle. It has a cast aluminum propeller and a dummy Menasco "Pirate" engine.

Speaking of engines, look at picture No. 5. Here is a fine example of a model engine, built by Donald Armstrong of 1320 N. North Avenue, Fairmont, Minnesota. It is an F-50 Cyclone motor built to a scale of 1/8-1". It was built of hard maple, balsa aluminum tubing and wire and there are more than 400 separate pieces in it. 100 hours were required to complete it. Armstrong says it is not perfect but includes many of the small details of the large motor. He indeed is modest. This picture does not show the keying on the shaft; however another view of the motor indicates that it has been worked out with precision. On the back of the motor is a miniature carburetor, made in complete detail. This certainly is a beautiful job and Armstrong is to be congratulated.

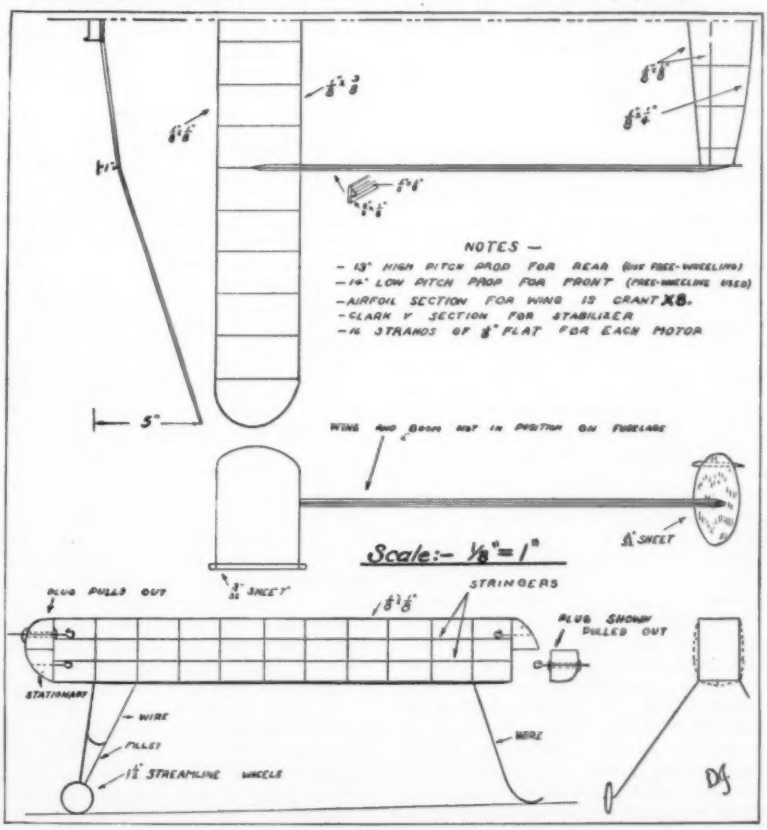


Pict. No. 4. A detail scale fuselage of brass tubing

We hear from our old friend in Japan, Mr. Moriichi Kitamura of 5,1-Chome, Kobikicho, Kyobashi, Tokyo. He tells us it is extremely difficult at present for him to obtain aeronautical publications, due to restrictions; however he receives occasional copies of MODEL AIRPLANE NEWS. Picture No. 6 shows two models which he has built from plans appearing in this magazine. They are Curtiss Navy fighters and have been built with the customary Japanese accuracy and neatness. Mr. Kitamura is now engaged in manufacturing various types of models for which there is a great call among Japanese fans.

Picture No. 7 shows Mr. Edward Soltis

(Continued on page 60)



A schematic layout for a puller-pusher contest model, by DeWayne Johnson

U. S. Army Ryan observation plane YO-51, called the flying motorcycle, with full length Fowler type flaps

FLASH-NEWS

SPECIAL TO MODEL AIRPLANE NEWS:

FLIGHT tests on Ryan's new YO-51 U. S. Air Corps observation model indicate that it will have the shortest take-off and landing run of any heavier-than-air stationary wing airplane. Powered by a P&W Wasp Junior of 450 horsepower, the high-wing parasol two-seater is equipped with the very latest of high lift devices including the famed Fowler flap, newly designed slots and elevator balances. Three have been ordered by the air corps at a cost of $132,000 and will be stationed at the army's autogiro field at Fort Sill, Oklahoma at the Artillery School.

Santa Catalina Island, annual mecca for over a million Southern California tourists, will soon have a $750,000 landplane airport, it was announced by Phil. K. Wrigley, owner of the islands and its thriving amphibian airline. Located atop a mountain craig, leveling will soon be under way and negotiations for the purchase of three Douglas DC-5 transports will soon be closed with a contract.

First production Lockheed "Bomber Chaser" (MODEL AIRPLANE NEWS, November, 1939 issue) YP-38 pursuit now undergoing preliminary flight tests at the skilled hands of veteran newly-promoted Captain Ben Kelsey. Refined in detail, faster and more maneuverable, this seven-miles-per-minute fighter will be the fastest standard service ship in the entire world. Twelve sister ships will roll off the production line at Lockheed's secrecy-shrouded sub-factory four miles north of the main plant early this spring. Selfridge Field pilots note: Multiply the speed and climb of your present Curtiss and Seversky pea-shooters by about three or four and prepare for a thrill!

Possibility that Boeing Aircraft, pioneer Seattle plane-builders, might migrate to the teeming Los Angeles aviation area, loomed recently when it was disclosed that wage schedules and the difficulty of attracting trained personnel to the far-distant northwest locale had made operation of the recently expanded plant trying. In slack times of lay-off, workers immediately head to Southern California leaving a dearth of experienced hands available for re-hiring. Conferences on the move will be held shortly.

Johnny Woodward, veteran flyer, was shot down and killed in the crash of his cargo plane by combined American and Mexican pursuit ships over the Douglas (Arizona) airport recently. Facing charges of illegal smuggling of gold bullion over the Mexican border, Woodward in company with Bert Farnsworth, had escaped jail in Hachita, N.M. two weeks before and had resumed his illegal trade immediately. Air corps personnel were automatically cleared of technical charges when their orders from the Sheriff's department of Douglas, Arizona were presented.

New lightplane models: Piper's "Cub Clipper" in prototype has been successfully test flown and production will start immediately. Designated Model P-1C, the Cub Clipper is a two-place (side-by-side) amphibian of the flying boat hull folding wheel type with a pusher Continental A75-9 mounted on spiders above the fuselage. Wings are strut braced and equipped with fixed tip-floats. Price will be only $2500 with a hull of aluminum alloy and standard Cub Coupe wing and tail surfaces. Aeronca Tandem Trainer, just announced, is a completely new ship for the ultra-low-price market. Complete details will be released soon.

Averaging nearly ten miles more than Jacqueline Cochran's year-old record, Edward J. Walz of Camden, New Jersey established a new lightplane 100-kilometer speed record of 118.746 miles per hour in a Luscombe 65 all-metal monoplane, the same model Jackie used. Official N.A.A. timing was used for the flight made over Floyd Bennet (New York City) Airport.

Major Alexander P. deSeversky, now a resident of Los Angeles where he is negotiating for a factory location, was presented with the Pacific Aviation Club Trophy for his outstanding transcontinental East-West flight of August 29, 1938 when he established a record of 10 hours, 2 minutes and 55 seconds. The flight was actually a delivery of Jacqueline Cochran's famed "13" Seversky speed-ship to her at Burbank Airport prior to her take-off in the Bendix Trophy Race three days later.

One-fourth of the total number of workers employed by the entire aviation industry are now on the payroll of the Douglas Aircraft Company of Santa Monica, California, it was recently shown. More than 15,000 men and women are now at work at the two divisions (Santa Monica, El Segundo) of the huge firm. First production DC-5 has been test flown and general performance figures have been improved according to Carl Cover, Senior Vice-President and Chief Test Pilot. Slated for KLM's trans-Asia run, it is the first of six ordered by the Dutch Company. Production is now under way in the Santa Monica Division on the YA-20 and YA-20A attack-bomber models for the Air Corps as well as 36 Model YB-23A medium bomber. Forty-one additional DC-3's are now on order for American Airlines which, upon completion will bring to ninety-nine the total DC-2 and DC-3 "Flagships" in service with that company.

One billion dollars in warplane orders have been promised to American plane builders by the recently centralized European purchasing commissions, it was announced recently. A plan to standardize purchasing and production to three types of pursuit and attack-bombers (Curtiss, Martin and Douglas) was rejected and the commission has returned to Europe for further instructions. They will return early in the Spring with definite authority to place orders in the amount of one billion dollars. NOW IS THE TIME TO GET INTO AVIATION!

On the hush-hush list is one of the most startling bits of news yet entrusted to FLASH NEWS. Wright Aeronautical Company's new secret military engine will be of the thirty-two cylinder flat opposed type and will develop 3200 horsepower. Lying in two banks of 16 cylinders each, the giant engine will be equipped with two turbo-superchargers and is designed primarily for in-a-wing installation in heavy bombers. First model has been promised by early Fall, Wright authorities indicated.

Gas Lines

(Continued from page 23)

received had been torn so that the name of the builder is not known. However we do know he is a resident of Buenos Aires, Argentina. Note the wing spars which have been built up most carefully, as well as the ribs and other parts of this ship. A spar of this type is exceedingly strong yet light. The builder of this little ship is only 16 years old and deserves considerable credit for his fine work. This is the fourth model he has built; the other three were rubber powered ones.

Picture No. 5 shows an interesting ship with its builder, Ervin M. Leihy of 3115 N. 4 Avenue, Billings, Mont. The ship has a wing span of 11 feet and a wing chord of 15 inches. The sweep-back is 38 degrees. The monocoque fuselage is constructed of 1/8 x 1/4" balsa strips. The wheels are 4 inches in diameter, pneumatic type. It is powered with a Forster motor which swings a 20-inch prop. The whole ship weighs 9 pounds. Mr. Leihy says it has ample power and flies beautifully at idling speeds with a take-off run of about 6 feet.

Many model builders have been wondering whether or not their motors are sent to them right off the production line or are thoroughly tested to make sure of their efficiency before they leave the factory. There are no reliable motor manufacturers at the present time who do not test their engines. Picture No. 6 shows a group of finished Gwinn Aero and Mighty Midget engines being tested at the Bunch model engine factory. The young man in the foreground is using a tachometer to determine the number of r.p.m. of one of the engines.

The weather in the eastern section of the country hasn't been able to stop gas model fans from holding regular contests. On a number of week-ends during the winter builders assembled at Creedmore, New York, to try out their latest ships. Some very unique planes were displayed.

One of them is shown in picture No. 7. This was built by Bob Hayes and he has equipped it with Handley Page leading edge slots to prevent the plane from stalling. The ship flew very well and climbed at an exceedingly steep angle.

Picture No. 8 shows another plane at the contest. It is a pusher of unusual design being displayed by its builder, Phil Sagona. This is an excellent illustration of how a low center of gravity may be obtained in a pusher. The wing mount together with the fuselage supplies the required cross sectional fuselage area. As you can see, the wing has been built exceedingly light in weight. The whole ship weighs very little. The motor is mounted directly behind the wing while the batteries are carried in the forward part of the fuselage.

First Miami Model Seaplane Meet

Harold Kulick sends us an account of a meet held recently in Miami, Florida:

"On the morning of December 31st the city of Miami inaugurated the first gas model seaplane meet to be held there. There were more than 50 contestants, with ships ranging from 18 inches wingspan to 5 1/2 feet span. The planes were flown from Biscayne Bay, which is ideally suited for just such events. The weather could not have been any better, with scattered clouds and bright hot sun, helping any flights which had the fortune to climb. As with all meets of this type, there were many 'dunked' crates and motors had to be dried out. To facilitate quick drying, a novel system with the use of a compressed air blower helped immensely. In this meet, as in many others, there were many novel float designs which were to have helped the planes in taxiing to take-off. Many planes got into the air; many more did not. It seems that model builders still have quite a bit to learn about designing floats. The meet ran quite successfully throughout the day, the city donating the cash prizes and a police launch to retrieve any planes which flew too far away. The best times were made by: first—tie: Bab Chaille and H. Silvers; 2nd, Joe Schurge."

Picture No. 9 shows George Ivey, Jr., with his all-metal fuselage gas job of original design. The wing is paper covered. A Forster engine supplies the power. This type of fuselage construction is very unique and worked out well in practice.

Picture No. 10 shows another entrant in the Miami meet. This is a 9 1/2 foot-span job built by Kurt Stevenson, who is shown holding it. It was a real thrill to see this large ship take off and perform like a full scale job.

Philadelphia

William Lukens, publicity manager of the Quaker City Gas Model Airplane Assn.,

(Continued on page 64)

Building The "Doodlebug"

(Continued from page 13)

Cover the tail in like manner as you did the wing. When this assembly is doped three or four times it is completed.

Final Assembly

A piece of bamboo for a tailskid is necessary, or if a little weight is needed back at the tail, a wheel will do nicely. An ordinary "Baby Cyclone" propeller certainly does a swell job of pulling the "little bug" heavenward. If you desire, you can make your own prop by carving it in the usual manner, from a basswood block, 3/8" x 1-3/8" x 12". The very front end of the fuselage can be cowled with sheet aluminum. Don't bother trying to cowl the motor as it's unnecessary.

Almost everyone has his own ideas on testing a new gas job so we won't say much on it. Of course it is rather necessary to have the model balance correctly. In this case, the center of gravity should be at bulkhead two; shifting the batteries or the angle of attack in the wing seems to be the best way of obtaining this balance. Set the timer for about fifteen seconds run and have the motor turn over slowly for the first flight. From now on the adjustments are up to the individual.

After this "DOODLEBUG" has flown it really should be trimmed up in fancy style; a streamlined fillet at the center section of the wing fairs it nicely into the fuselage. Well, this just about finishes the great contest model, so good luck with it, builders.

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McLACHLEN BUILDING — WASHINGTON, D. C.

Designers of

AIRTRACK RADIO SAFE LANDING SYSTEM

NEW YORK OFFICE — 200 FIFTH AVENUE
CHICAGO OFFICE — 549 WASHINGTON BLVD.

WASHINGTON INSTITUTE OF TECHNOLOGY
McLACHLEN BLDG., WASHINGTON, D. C.

YES! I WANT TO KNOW ABOUT THE SENSATIONAL NEW WIT-KITS FOR 1940

DEALER _____

ADDRESS _____

CITY _____

Join the MEGOW Parade!

Sensational WAR MODELS!

BELL PURSUIT Famous plane of terrific speed and fighting ability.

☆

Now you build flying models like you read about in the war news every day. The biggest values ever offered for the price. Simple construction and sound design resulting in fine flying and greater duration. All details of originals faithfully carried out. 24-inch wingspan. Full color insignia sheets and Motor Hum Device included in each kit.

25c each

(By mail, post. 10c extra)

HAWKER HURRICANE Chief representative of the British in the air.

CURTISS PURSUIT Sensationally effective. Favorite of the French army.

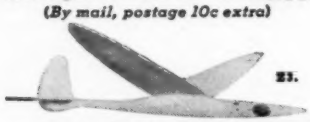
RYAN STM Interesting two-seater training model of the U. S. A.

GLIDERS Galore

Z3. HAND-LAUNCHED GLIDER

A Class B Contest model of all-balsa construction. Wingspan 20 inches. Makes consistent flights for 40 seconds, and although brand new in the field, has already made several flights of over one hour. **25c**

(By mail, postage 10c extra)



Z4. TOW-LINE GLIDER

A Class D Contest model with mon... coque fuselage. Wingspan, 54 inch... Aspect ratio, 15 to 1. Makes consist... flights of over one hour . . . $1.0...

(By mail, postage 15c extra)

...A NEW STINSON 105 FLYING MODEL

50c *(By mail, postage 10c extra)*

A new addition to the famous Megow line of 30-inch rubber-powered flying models. Real "class" in every ... and a beautiful flier.

...AND A BIG NEW RYAN STM TRAINER

50c *(By mail, postage 10c extra)*

An opportunity for you to build, easily and quickly, a most interesting 30-inch model of this outstanding plane.

Megow

Color-Coded BALSA WOOD

When you buy Balsa Wood from your Megow dealer, you can identify its hardness. You can select the right kind of wood to build each part. The ends of each sheet or strip are colored according to this code:

Extra Hard .	*Black*
Hard. . . .	*Green*
Medium . .	*Red*
Soft. . . .	*Orange*
Dead Soft . .	*Yellow*

Color-coded Balsa Wood costs no more than ordinary, but it saves work and helps produce superior models.

Megow's

KWIK-DRY CEMENT

According to exhaustive tension and bending tests in our Research Department, this cement far surpasses any we have ever tried. It contains new ingredients that give it quick, firm grip. It is transparent, waterproof, oilproof, flexible and quick-drying. Unsurpassed for model building and general household use. In no-waste tubes, 5c and 10c. Large sizes in cans and bottles. Ask at your dealer's, or order from catalog, if he cannot supply you.

Insist upon Megow's

DEPT. MA, HOWARD & OXFORD STS., PHILA...
217 N. DESPLAINES ST., CHICAGO, ILL., or GREAT WEST... MERC. CO., 710 MISSION ST., SAN FRANCISCO, CA...

WORLD'S LARGEST MANUFACTURERS OF ...

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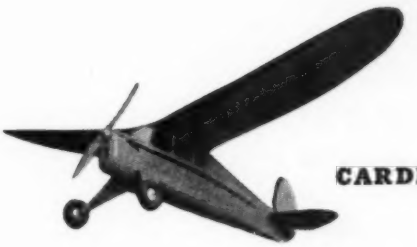
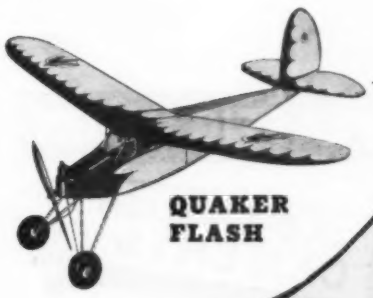




MEGOW'S Gas-Powered MODELS!

The most extensive line of big successes in the gas-powered field. Every model a product of the great Megow Engineering Laboratories—the very latest in model construction and design.

SOARING EAGLE. 3-unit construction, easy to build, transport and fly. Marvelous in performance. Climbs at steep angle, flies without hanging on propeller. Low-mounted wing—no tendency to loop.

Class A. Span 46". For any ".A" motor. Finished propeller **$2.95**

Class B. Span 54". For any ".B" motor. Finished propeller **$3.95**

Class C. Span 6 ft. For any 1/8 h.p. motor. Finished propeller and puncture-proof rubber wheels . . . **$4.95**
(By mail, postage 20c extra)

PIPER CUB. Beautiful model, easy to build. Megow's ready-curved Leading Edge. Span 52¾". For any ⅛" motor **$3.95**

CARDINAL. Ready-to-use propeller. Metal parts die-cast. Special rubber wheels. For any ⅛" motor. Span 48" **$3.95**

QUAKER FLASH. The world's champion. Favorite of thousands. 3½" puncture-proof rubber wheels. For any ⅛" motor. Span 67" **$4.95**

COMMANDER. Hollow-carved Leading Edge. Detachable wing mounting. Realistic cabins. 6-ft. span. Takes any ⅛" motor. Megow Streamlined Rubber Wheels **$4.95**

CADET. Similar, but smaller. 51½" span. For any ⅛" motor. 2½" wheels **$3.95**

Any GAS-POWERED MODEL sent by mail, postage 20c extra

WIN A FREE Trip to the NATIONAL MODEL AIRPLANE MEET in Chicago!

BIG CASH PRIZES!

Thousands of Other Prizes!

WOULDN'T it be wonderful to go to the big National Model Airplane Meet in Chicago this summer . . *all expenses paid?* Well, that is just one of the big prizes you may win by joining the Megow Contest at your dealer's. When he announces the Megow Contest, ask him for full details and join immediately. He will offer many attractive prizes, and on top of that, you may win one of the big free, all-expenses-paid trips to the National Meet—or one of the many CASH PRIZES that will be offered!

See your Megow Dealer today. Ask for full details, join the Contest and get your Contest Button. Start your model right away . . and remember, it must be a Megow!

SEND 5¢ POSTAGE TODAY

for big, profusely illustrated catalog of Model Airplanes, Ships and Railroads . . . equipment and supplies for hobbycrafters.

Megow Products, Limited—Toronto, Ont., A. Warriner, Voorberg, Ltd., A-One Pty., Ltd., Sydney, Australia. Eastern Model, Kowloon, Hong Kong, China. Lopez & Ferrer, San Juan, P.R.C. Estrada, Mexico, D. F. Granger Frères, Ltd., 84 Notre Dame, Ouest, Montreal, Canada.

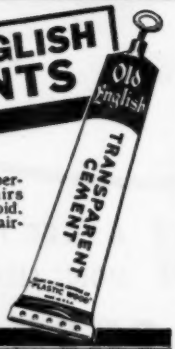
AIRPLANES, SHIPS AND NO-GAUGE RAILROADS

MODEL MAKERS!
TRY PLASTIC WOOD

For modeling airplanes, ships, coaches, trophies, puppets—PLASTIC WOOD is an ideal medium. It handles like putty; hardens into wood. Moulds readily—and when dry can be carved to secure any details desired. In cans or tubes at paint, hdwe., 10¢ stores.

PLASTIC WOOD

OLD ENGLISH CEMENTS



This "fixer" quickly and permanently joins and repairs china, glass, wood, celluloid. Excellent for use in model airplane making.

TRANSPARENT OR METAL COLOR

FREE UP-TO-THE MINUTE 1940 CATALOG

JUST OUT—A big NEW illustrated CATALOG on kits. Listing many items—supplies, etc. Just the thing you need to keep you up to the minute. Really a MODEL BUILDERS GUIDE. Don't DELAY—

WRITE NOW TO → BURKARD MODEL ENG. CO. 2 EAST AVE. LARCHMONT, N. Y.

Academy of Model Aeronautics

(Continued from page 10)

score cards—10c each; additional container-folders—10c each.

Sponsored by the LICENSED AIRMEN OF AMERICA, a movement is under way to get thousands of American boys into the air on their own initiative. Unlike the present government sponsored C.A.A. pilot training program the Licensed Airmen plan applies without restriction to all boys between the ages of 16 and 21. While a number of character-building "Air Youth" programs have been undertaken by various organizations, they have all stopped with encouragement of model plane flying and none has undertaken actual flight training operations. The Licensed Airmen plan, under the direction of Paul W. Hairgrove, and with the cooperation of the Southern California Soaring Association directs the efforts of the boys towards the construction and flying of full scale sail-planes and gliders. The result is a relatively safe low-cost training program which, it is said, will develop thousands of pilots.

Classes and Records

Class A is up to and including .20; Class B—.30; Class C—1.25. Combined Class—models using engines up to and including 1.25 and meet all other specifications for internal combustion powered planes. This event is for small local meets where scarcity of entries or prizes would make it inadvisable to conduct separate gas events with separate awards.

The N.A.A. will recognize national gas model records made only in Class A, B, C. Record performances in combined class will be accepted in whichever of the 3 classes it fits, provided it exceeds that class record by 2%.

Scranton Chapter

A. J. Hoveleski of 926 Delaware Street, Scranton, Pa., member of the Anthracite Gas Model Club, writes:

"We have here in Scranton a very fine group of model builders who three years ago organized the Anthracite Gas Model Association and are a junior chapter of the N.A.A. We have approximately forty members, and we hold monthly competitions at the Scranton Airport.

"Plans were made at our last meeting to hold our annual contest of Sunday, August 3, 1940, which will be an invitation meet. Prizes will consist of trophies, cash and merchandise (motors, kits, etc.). This will be a sanctioned N.A.A. meet; entry blanks and information may be obtained from W. R. Hawkins, 926 Delaware Street, Scranton, Pennsylvania.

"The Scranton Exchange Club has announced their willingness to cooperate with the local club, and have as an objective for 1940, to send three boys to the nationals to represent the cream of our local model builders.

"At our last annual contest we attracted four thousand spectators and contestants from four different states, and we hope that we will be able to do better this year."

Connecticut Liberalizes Gas Model Regulations; New Rules Patterned After N.A.A. Common-Sense Restrictions

Following a meeting with state model aviation leaders and a representative from the N.A.A. Model Division, Charles L. Morris, Connecticut Commissioner of Aeronautics, has just issued a new set of rules which are now a part of the State Laws governing the flying of model aircraft in that State.

Since there are few good flying sites in the "Nutmeg" state outside of regular or emergency airports, Connecticut gasoleers have accepted the new rules with enthusiasm.

Along with N.A.A. Contest Directors, Al Lewis attended the session which preceded the final announcement of the new rules. Lewis flew up to the meeting with Bill Strohmeyer of the N.A.A.'s Private Flying Division and on the way was able to make an aerial tour of the State which led Lewis to agree with the Connecticut aeromodeling leaders that outside of airports, there were few available gas sites in the state.

The new rules follow:

Connecticut Regulations Governing the Flying of Aircraft Models

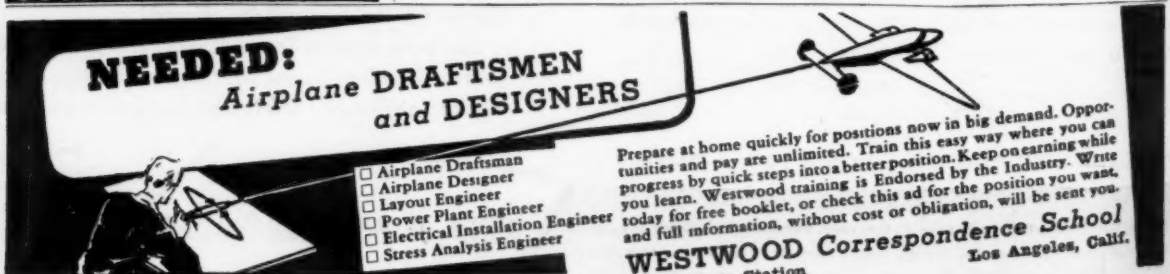
In accordance with the provisions of Section 1064E of the 1939 Cumulative Supplement, General Statutes of Connecticut, the following regulations are hereby in effect governing the flying of aircraft models:

1. RUBBER BANDS. Aircraft models, if powered by rubber bands, are exempt from these regulations.

2. AGE LIMIT. No person less than 14 years of age shall fly, or cause to be flown, any free-flying aircraft model powered by other than rubber bands.

3. SIZE LIMIT. No person shall fly, or cause to be flown, any free-flying aircraft model powered by other than rubber bands, if such model weighs more than *seven pounds*, nor if it has a wing-loading of less than eight ounces per square foot.

4. LIMIT OF FLIGHT. A suitable automatic timer, set for a *maximum engine*


NEEDED:
Airplane DRAFTSMEN and DESIGNERS
☐ Airplane Draftsman
☐ Airplane Designer
☐ Layout Engineer
☐ Power Plant Engineer
☐ Electrical Installation Engineer
☐ Stress Analysis Engineer
Prepare at home quickly for positions now in big demand. Opportunities and pay are unlimited. Train this easy way where you can progress by quick steps into a better position. Keep on earning while you learn. Westwood training is Endorsed by the Industry. Write today for free booklet, or check this ad for the position you want, and full information, without cost or obligation, will be sent you.
WESTWOOD Correspondence School
905 Village Station
Los Angeles, Calif.

run of not to exceed 30 seconds shall be installed on all free-flying aircraft models, other than those powered by rubber bands.

5. RADIO CONTROLS. If *radio control* is installed in any model, sufficient to control the aircraft at all possible distances from the transmitter, the restrictions in Sections 3 and 4 may be disregarded, provided, however, that the maximum gross weight does not exceed *25 pounds.*

6. SITES. No free-flying aircraft model, other than those powered by rubber bands, shall be flown *within 2 miles of any airport* (except as provided in Section 7). No such model shall take off from a point closer than *600 feet from any building or highway.*

7. AIRPORT FLIGHTS. Model aircraft may be flown from an airport provided that—

a. Permission in writing shall be secured from the Airport Manager or his authorized representative;

b. All full-scale aircraft flights originating on the airport shall be suspended;

c. No model shall be released for flight when any full-scale aircraft is in the vicinity of the airport,

d. The automatic timer on the model shall be set for a maximum engine run of not to exceed 15 seconds;

e. An area of approximately 500 feet square shall be set aside by the airport manager or his authorized representative and shall be marked by suitable warning flags spaced not more than 75 feet apart;

f. Said area shall be in a portion of the airport farthest from the portion that would be used by full-scale aircraft taking off or landing under the current wind conditions;

g. The take-off point of the models shall be at least 600 feet from any highway or building;

h. Not more than one such model shall be in the air at any given time, and the controls shall be so set that each such model will at all times during its flight remain within the airspace above the flagged area.

Chapters of the Academy of Model Aeronautics in Good Standing March, 1940

For complete information relative to starting an Academy chapter in your city —write to the secretary of the A.M.A., at its new headquarters address—1401 Pennsylvania Ave., N.W., Washington, D.C. Enclose 6c in stamps with requests for chapter information; 3c in stamps for individual membership information.

Little Rock Gas Model Club, Little Rock, Ark.

Woodland Gas Model Club, San Francisco, Calif.

R. H. Dana Jr. High School Chapter, San Pedro, Calif.

Exchange Club Gas Chapter, Denver, Colo.

Norwalk Gas Model Club, E. Norwalk, Conn.

Hartford Gas Model Club, Hartford, Conn.

Model Aero Engineers, Hartford, Conn.

Manchester Gas Model Club, Manchester, Conn.

Star Model Airplane Assn., Wilmington,

SUCCESS!

Ideal MODELS

Ideal's CLASS "A" PRIZE WINNING GAS JOB TOPS 'EM ALL!

At Your Dealer's!

$1.95 LESS MOTOR

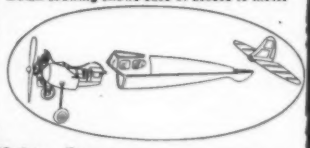
By Mail 20c Extra

"MOLECULE"

36" Wingspread—25" Overall

First-flight success! That's the record of this job. Perfected by Ideal from Louis Garami's-Air Trails' prize-winning plans. See it at your dealer's.

Detail drawing shows ease of access to motor



Molecule's Prize-Winning Power is furnished by the Famous Mighty Atom, complete $12.50, postpaid

Another Exciting IDEAL SCOOP!

3 BRILLIANT NEW 50" WINGSPAN FLYING MODELS

STINSON 105

AT DEALERS only $1.00 Each BY MAIL, 20c Extra

Each one of these swell new rubber-powered jobs features Ideal's brand new, EXCLUSIVE BENTWOOD PROP, far more efficient than Balsa saw cuts!

SPITFIRE

NORTH AMERICAN TRAINER

DEALERS!

Write today for prices and catalog

BIG HOBBY CATALOG • 10c

Ideal MODELS IDEAL AEROPLANE & SUPPLY CO., Inc. 20-24 West 19th St., NEW YORK

Pacific Coast: Model Boat & Aircraft Co. 1356 5th Ave., San Diego, Calif.

VISIT Ideal's HOBBY CENTER

SCIENTIFIC'S $225.0

IT'S NEW

CLASS "A" – Award $50.00

"STARLING"

Here's an easy way to get a nice bundle of ... SCI... the 1940 Chicago national championships. You will ... win ... nothing complicated . . . everything is easy. SCIENTIFIC has ... are as follows:

CLASS "..." – ...ward

"ENSIGN"

STARLING

$1.95 PP LESS MOTOR

"STARLING" CLASS "A" GAS MODEL

WINGSPAN—40" **LENGTH OVERALL 27¼"**
WING AREA—210 sq. in. **WEIGHT WITH MOTOR 11¾ oz.**

Here's the newest member of the SCIENTIFIC model family which advance notices herald to be the next champion. While the "STARLING" was designed for perfect performance with the Atom motor, it is an all round model for other Class "A" motors, too. The lines and beauty of the Starling are only exceeded by its ability to perform. The wing ribs, tail parts, fuselage sides and bulkheads are all die cut, assuring you exactness. The fuselage is all balsa and is constructed on an entirely new principle, making it many times stronger. The entire motor hookup and landing gear are attached as one unit with an adjustable battery case for balance adjustment. Another feature is the ready-made clamp for attaching the landing gear, the finished propeller, and new clear detailed full-size plans, besides the streamlined balsa wheels, and oh, so many other items are included in the kit which is 100% complete. Price, less the motor..... **$1.95 P.P.**

ENSIGN

WINGSPAN 50"—OVER-ALL LEN... —WING...

The "ENSIGN" was designed especially to conform with ... K.A.A. ... lining to the minutest detail stamps the "ENSIGN" tops ... and Glide... sits on her tail and spins her way up there in close ... ...'t give h... run or you will lose her in the clouds. When the motor ... ...ves into ... balance and stability. She is a beauty in both looks and ... ... You will ... next Class B contest and you will be prouder still when ... ... first p... Most surprising is the case with which you will be ... ... new ... almost no time at all you will have her ready for a trial ... ..., the k... simplified plans and all necessary materials including ... ...lined ba... all hardware, ignition wire, cement, bamboo paper, plastic ... ...plete in...

- **Motor mount specially constructed to allow for ... and unm...**
- **Battery box is adjustable for weight balance adjustment ... landing ...**

landing gear clamp (a new SCIENTIFIC feature).

SEE YOUR DEALER O...

SCIENTIFIC MO... AIR...

"GAS MODEL ... EQUA...

218-220 MA-5 MAR... ST.,

CASH PRIZE CONTEST

$225.00 CASH GIVEN AWAY

ndle of ... SCIENTIFIC is giving away $225.00. All you have to do is enter one of the SCIENTIFIC models featured here in You will ... win the trophy offered for the event but SCIENTIFIC will also reward you with cash for your championship effort. There is sy. SCI...IC has designed the models. all of which are true champions . . . all you do is build them and enter them. Cash prizes

For *CLASS "A"*—Starling—$50.00 in cash
CLASS "B"—Ensign—$75.00 in cash
CLASS "C"—Mercury—$100.00 in cash
or any Scientific gas model

RULES: Your entry must be a SCIENTIFIC ship. Your championship winning model must bear a decalcamania showing the name of your ship on your winning flight (decalcamania included free in every kit.)

ADDITIONAL PRIZES TO BE ANNOUNCED

...ward
$75.00

...NSIGN"

$2.95 PP
LESS MOTOR

...L LENG...—WING AREA 372 SQ. IN.
...orm with ... A.A. Standards for B ships. Complete stream... "N" top ... and Glidability. On a limited engine run she just ...se gradu... n't give her too much motor or too long an engine ...the motor ... into the flattest glide you ever saw. She has ...oks and ... on will be proud to enter the "ENSIGN" in your ...ill wher... first prize.
...u will be ... this new "ENSIGN" champion. In ...for a trial ... the kit is complete with large ...nding pair ... balsa wheels, finished prop, ...ipod, gian... plete instructions.
...low for ... and ...mounting of motor in ship ...adjustmen... landing gear formed • Finished

$2.95 P.P.
LESS MOTOR

"MERCURY"

MERCURY

WINGSPAN 6 FT., OVER-ALL LENGTH 52"—WING AREA 750 SQ. IN.

$4.95 PP
LESS MOTOR

SCIENTIFIC "MERCURY" is so outstanding in both appearance and performance that she is really in a class by herself. Our engineers have incorporated a balance that eliminates imperfection but insures straight and fast flying. The slow roll after the motor cuts brings her out on top as she starts her long, slow flat glide to earth, making it appear that she is actually being handled by a human hand. It has staggered tail surfaces, as protection against spinning; a tapered wing, for greater flying efficiency and a reinforced front end for the nose to successfully enable this gas model to withstand severe motor vibration and the impact of landing. Weight complete with motor and ignition units 2¾ lbs. The kit is complete with all necessary materials including a pair of 3½" streamline balsa wheels and a full size plan with complete directions. Go to your dealer today to see this Scientifically designed airplane. Postpaid.....

$4.95 P.P.
LESS MOTOR

...ER ORDER FROM
...MO... AIRPLANE CO.
...ODEL ...QUARTERS"
...MAR... ST., NEWARK, N. J.

J. L. SPECIAL

"America's Finest" MINIATURE RACE CAR

Standard Kit Price
(Plain Metal Finish)

ONLY $23.50

De Luxe Kit $25.00
(Highly Polished)
Special Kit $16.00
(Baked enamel finish. Choice of colors: red, black, white.)
Terms: $5.00 deposit with order. Balance C.O.D. Subject to your approval. Or send 25c for complete information, consisting of two photos, illustrated folder and 18x24 over-all dimension blueprint.
Note: Car guaranteed as represented or your money refunded.

J. L. SPECIAL

OUTSTANDING FEATURES
1. All aluminum.
2. Front or rear drive. Hardened spiral gears running in oil.
3. Ball bearings thruout.
4. Genuine steel springs, front and rear.
5. J. L. Engineered semi-pneumatic tires.
6. Special quick-change battery compartment.

J. L. ENGINEERING SERVICE
2246 28TH ST. • SANTA MONICA, CALIF Dept. A

5 Free Trips to the Nationals!

A bona-fide offer that may bring YOU a trip to the 1940 Nationals in Chicago. Fly one of our extra-value ships to any place in any sanctioned gas model meet, report your accomplishment to us on a New Cyclone entry blank, and it may win you a trip to Chicago in July. Ask your dealer for further details. . . and for one of those super flying New Cyclone ships.

FLY THESE SUPER SHIPS

50" THUNDER BIRD, illustrated, even better under new NAA rules. Ultra-value kit for Class B or A models, less wheels, only..... $1.95 p. p.

Deluxe Kit, with rubber wheels, finished prop., color dopes..... $3.50 p. p.

66" Class C THUNDER BIRD, complete kit less wheels..... $2.95 p.p.

Deluxe kit, with rubber wheels, color dopes, Hol-Tite Battery Case, prop..... $4.95 p. p.

NEW CYCLONE AIRCRAFT CO.
217 Flatbush Ave. Dept. A 20 Brooklyn, N.Y.

FREE POSTAGE on all U.S. orders east of Miss. for $5.00 or over. West of Miss. or under 50c, add 10c postage. Canada, U.S. possessions, and foreign, over $1.00 add 15%. Foreign, under $1.00, add 15c. No C.O.D. No stamps.

FREE 60 1/16x1/16x18 Balsa, 1 bottle Cement and 1 pair 2" wheels—all FREE with orders of $1.00 or more.

18" BALSA

1/16x1/16	100.	5e	
1/16x1/8	35 for	5e	
1/16x3/16	18.	5e	
1/16x1/4	15 for	5e	
3/32x3/32	30.	5e	
1/8x1/8	30 for	5c	
1/8x3/16	12 for	5c	
1/8x1/4	10 for	5c	
3/16x3/16	8.	5c	
1/4x1/4	6 for	5c	
3/8x1/8	6 for	10c	
3/8x1/16	5 for	5c	
3/8x3/8	each.	2c	
1/2x1/2	2 for	5c	
1/64x2	4 for	10c	
1/32x2	8 for	10c	
1/16x2	8 for	10c	
3/32x2	7 for	10c	
1/8x2	6 for	10c	
1/4x2	3 for	10c	
1/4x1/2	3 for	5c	
1/4x3/4	each	5c	
1/4x1	each	3c	

3" sheets or 36" lengths, double above prices; 5 foot Balsa, double 36" prices. Add 10c pckge. chge. for 36" lengths—20c for 5-foot lengths.

SHEETS 12"x2"

1/16 or 1/32	10 for 10c
1/8	7 for 10c
3/32	8 for 10c
1/4	3 for 7c
1/2	each 5c
1	each 7c

18" PLANKS

1x1	5c; 1/2x2	6c
1x1 1/2	9c; 1x2	10c
1x3	15c; 2x2	18c
2x3	23c; 2x6	39c
3x3	40c; 3x6	75c

WIRE
6-8-10-12-14
2 ft..... 1c
1/16 dia. 5 ft. 12c
.050 3 ft. 5c
3/32 dia. 5 ft. 15c
1/8 dia. 5 ft. 25c

PROP SHAFTS NEAR HOOKS
12 for..... 8c

CAMEL'S HAIR BRUSHES
Small 3c; Lge. 5c
Extra large..... 8c
Flat, large..... 10c

PROP BLOCKS

1/2x3/4x6	6—5c
3/4x1x8	3—5c
3/4x1 1/4x10	3c ea.
3/4x1 1/4x12	3c ea.
1x1 1/2x12	4c ea.
1x1 1/2x15	7c ea.

PROPELLERS

Balsa	Paul-O-Mach. Cut	Wina
5"	4c	10c
6"	5c	15c
7"	6c	20c
8"	7c	25c
9"	8c	30c
10"	9c	35c
12"	11c	45c
14"	14c	
15"	15c	55c

COLORED DOPE
6c per oz.; Large bot. 10c; 1/2 pt. 35c

CLEAR DOPE OR THINNER
5c per oz.; Large bottle, 8c; 1/2 pt. 30c; 1 pt. 45c

CLEAR CEMENT
5c per oz.; large bottle, 8c; 1/2 pt. 35c; 1 pt. 55c

REED
1/32-1/16 2 for 1c
3/32 or 1/4 1 ft. 1c

WHEELS per pr.

Birch	Bisa	Celu
1/2 .01	.03	
3/4 .02	.04	.05
1 .03	.05	.07
1 1/2 .04	.08	.10
1 7/8 .07	.10	.16
3 .15	.15	.30

THRUST BEARINGS, dz. Asst. 10c; lge. 15c

TISSUE, AA
All col., dox. 19c
Silver ..... ea. 5c
Superfine, wh. 5c

WASHERS
1 doz. 1/4 or 1/4 1c

RUBBER

.045	25 ft. 5c
1/16 sq.	15 ft. 5c
1/4 flat	15 ft. 5c
Skein	55c
3/16	10 ft. 5c

INSIGNIA
24 and stripes 5c

15" BAMBOO
1/16x1/4 6 for 5c
Shredded, 36—5c

SPONGE RUBBER WHEELS
pair 1"..... 15c
1 1/4"..... 18c

PNEUMATIC WHEELS
3 1/2" pair....$1.25

BUSHINGS
1/16..... 4 for 1c

GAS PROPS
12"—13"..... 25c
Rits Props.....50c

SHEET ALUM.
.000 4x4x15
2 sheets..... 3c
.005 in.....6x6....5c
.010 in.....6x6....6c
1/32.....6x6.....15c
1/16.....6x6.....30c

CELLULOID
6x8..... 5c
12 1/2x16..... 19c

RUBBER LUBE
Paste or Liq. 10c

ALUM. TUBING
1/16, 3/32, 1/8 ft. 7c
3/16, 1/4, ft. 10c
5/16 ft..... 15c

NOSE PLUGS
1/8.....12 for 8c
Smith Coil $2.50
Toggle Switch .30
Knife Switch .25
Booster Plug and Jack.....10
Battery Boxes
Penlite & 1" .40
Penlite, 1 1/2" .50

BATTERIES
Fenlite 5c
Large or Int. 10c
Model Pins pk. 5c
Tru Cut Knife 10c
Plastic Balsa 25c
Austin Timer 1.25
Champion Spark Plugs ..... .65
Alligator Clips ..... for .15

NOSE BLOCKS

1x2x1	1c
2x2x1	2c
3x3x1	5c
3x3x2	8c
3x3x3	10c
5x5x2	25c

WOOD VENEER PAPER
Ea. 10c; 2 for 15c

DOWELS
1/16x6" doz. 5c
1/8x18" 2 for 3c
Water Sprayer 15c

Sandpaper 12 for.....5c
Brass Bushings 4 for.....1c
Alum. Spinners 30c
Gas Mod. Silk yard 55c
Clock Timer 0 sec. to 1 min.....$1.95

IGNITION WIRE
(high tension) ft. 5c
Hookup, ft.....2c

BAMBOO PAPER
White, 2 for.....5c
Yellow, red, green or blue, each..10c
Exhaust manifold 75c
Condensers 15c
Rubber tubing 1/8" ..... ft. 5c
Ball bearing wars 10c
Gas funnels ...30c
Masking tape, large roll....25c
High tension leads 15c
No. 70 oil, 1/2 pint 30c

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Ohlsson 19	14.50
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Bloomington Gas Model Club, Bloomington, Ill.
Chicago Aeronuts, Chicago, Ill.
Chicago Times Air Cadet Corps, Chicago, Ill.
Gas Model Aeronauts, Chicago, Ill.
Pretzel Gas Model Club, Freeport, Ill.
Henry Aero Club, Henry, Ill.
Kewanee Gas Model Club, Kewanee, Ill.
Rockford Gas Bugs, Rockford, Ill.
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Northern Ind. Gas Model Assn., Gary, Ind.
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Purdue Aeromodelers, W. Lafayette, Ind.
La Porte Division, N.I.G.M.A., La Porte, Ind.
Grant County Modelers, Marion, Ind.
Muncie Gas Hawks, Muncie, Ind.
Valparaiso Division, N.I.G.M.A., Valparaiso, Ind.
Ames Prop Busters, Ames, Iowa.
Sioux Helldivers, Sioux City, Iowa.
Wichita Gas Model Airplane, Assoc. Wichita, Kan.
Louisville Model Club, Louisville, Ky.
Portland Gas Model Club, Portland, Maine.
Baltimore Model Airplane Assn., Baltimore, Md.
Aero-Craftsmen Gas Model Club, Baltimore, Md.
Holyoke Gas Model Club, Holyoke, Mass.
Jordan-Traveler Jr. Aviation League, Boston, Mass.
Model Aero Engineers, Fall River, Mass.
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Detroit N.A.A. Jr. Chapter, Detroit, Mich.
Escanaba Aero-Knights, Escanaba, Mich.
Lansing Model Airplane Assn. E. Lansing, Mich.
Radio Flashes Model Club, Holt, Mich.
American Legion Gas Modelers, Jackson, Mich.
Kazoo Aeronuts, Kalamazoo, Mich.
Knights of the Dope Bucket, Monroe, Mich.
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North Omaha Aeronauts, Omaha, Neb.
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Prop Wash Model Club, Laurel Springs, N.J.
Linden Model Aircraft Club, Linden, N.J.
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Queen Aero Model Assn., New York, N.Y.
Richmond Model Flying Club, Port Richmond, S.I., N.Y.
Poughkeepsie Gas Modelers Assn., Poughkeepsie, N.Y.
Pulaski Model Club, Pulaski, N.Y.
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Main Line Model Aircrafters, Philadelphia, Penna.
Philadelphia Gas Model Assn., Philadelphia, Penna.
Philadelphia Model Aeroplane Assn., Philadelphia, Penna.
Quaker City Gas Model Airplane Assn., Philadelphia, Penna.
West Philadelphia Gas Model Club, Philadelphia, Penna.
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Model Wings Gas Model Club, Pittsburgh, Penna.
Anthracite Gas Model Airplane Club, Scranton, Penna.
Springfield Model Club, Springfield, Del. Co., Penna.
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Fort Worth Gas Model Assn., Arlington, Texas.
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Dallas Gas Model Assn., Dallas, Texas.
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Houston Miniature Aircraft Club, Houston, Texas.
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Virginia Model Assn., Hampton, Va.
Olympia Miniature Aircraft Club, Olympia, Wash.
Seattle Division, N.W.G.M.A., Seattle, Wash.
Yakima Gas Model Club, Yakima, Wash.
V.F.W. Model Aviation Club, Clarksburg, W. Va.
Hangar No. 13, Beloit, Wisc.
Madison Gas Model Club, Madison, Wisc.
Clipper City Gas Model Club, Manitowoc, Wisc.
Milwaukee Aeronuts, Milwaukee, Wisc.
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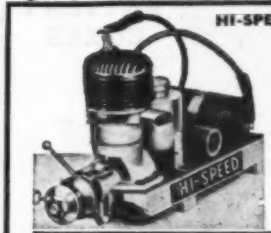

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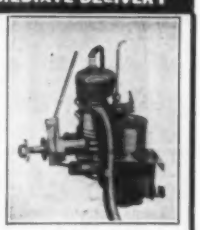

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Same as Standard Airstream less coil and condenser. $13.85

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Only timer designed *exclusively* for gas models. ● Adjustable duration from 1 sec. to 10 min. Accurate settings for 20 or 30 sec. motor runs. ● Stop watch accuracy makes it the ideal timer for contests. ● Has drilled holes for mounting, and improved contact points. ● This lightest of timers carries unconditional guarantee against defective parts or workmanship. ● Wiring and installation diagrams included.

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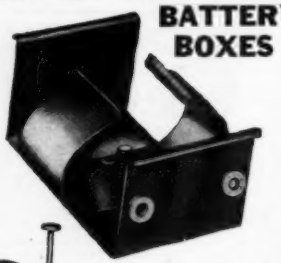


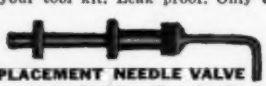
Holds cells securely in place yet allows them to be easily replaced without soldering. Adjustment screw allows holder to be shifted for balance adjustment.

Penlite wt. 1/4 oz.....40c
Medium wt. 3/4 oz.....40c
Large wt. 1 1/2 oz.....50c

●

GAS CAN

Every gas modeler needs this handy 1/2 pint pump can. Makes refueling easy, and keeps out the dirt. Holds plenty of gas for a day's flying yet is small enough to fit into your tool kit. Leak proof. Only 60c.



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1940 MODEL AIRCRAFT COMPETITIONS

Sanctioned by the Contest Board of the National Aeronautic Association

Conducted According to the Regulations of the Academy of Model Aeronautics

(Additional listing will be presented in forthcoming issues)

For full information write to Academy leader listed. His place of residence is same city as competition, unless otherwise noted.

April 6—BOSTON, MASS. Indoor meet of Jordan Marsh-Boston Traveler Junior Aviation League in Irvington St. Armory. Write Gunnar Munnick, 101 Alstead St., Quincy, Mass., for details.

April 13—PHILADELPHIA, PA. Indoor flying scale model meet of Philadelphia Model Aeroplane Assoc. in 108th Field Artillery Armory. Write Victor Fritz, 1427 Spruce St.

April 13—PHILADELPHIA, PA. Monthly meet of Quaker City Gas Model Airplane Assoc. at Northeast Airport. Jack-pot cash awards and monthly trophy. C. H. Stagg, 7818 Loretta Ave.

April 20—BOSTON, MASS. Indoor meet of Junior Aviation League. See April 6 note.

April 27—BOSTON, MASS. Outdoor meet of Junior Aviation League at Smith Playground, Allston. See April 6 note.

April 28—PITTSBURGH, PA. Allegheny Mt. Area model club meet at Butler Airport. Merchandise prizes. Harry Vogler, 1633 Duffield St.

May 4—BOSTON, MASS. Indoor meet of Junior Aviation League. See April 6 note.

May 5—WYANDOTTE, MICH. Indian City Model Airplane Club gas meet. All classes for merchandise awards. Fred Bashore, 558 Bondie St.

May 5—SALT LAKE CITY, UTAH. Class B gas meet, merchandise prizes at Utah Central Airport. Jack Douglas, 105 E. 2nd St., South.

May 12—E. PATTERSON, N.J. Second annual gas meet at Cherry Hill for all classes. $60 cash, trophies, merchandise. Vincent Bonnema, 18 Hobart Place, Garfield, N.J.

May 18—BOSTON, MASS. Outdoor meet of Junior Aviation League. See April 6 note.

May 18—S. PLAINFIELD, N.J. Third annual Queen City Gas meet for all classes at Hadley Field. Trophies, cash and merchandise. Walter E. Marienschek, 1800 Myrtle Ave., Plainfield.

May 19—SAUGUS, MASS. N. E. States gas championships at Saugus race track. Trophies and merchandise. Leonard Day, 2 Dodge Ct., Danvers.

May 19—PITTSBURGH, PA. Allegheny Mt. Area model club meet at Butler Airport. See April 28 note.

May 30—LINDEN, N.J. New Jersey outdoor championship meet. Gliders and rubber models. Trophies, medals and merchandise. Frank M. Krysiak, 321 E. Price St.

June 1—BOSTON, MASS. Indoor meet of Junior Aviation League. See April 6 note.

June 2—POUGHKEEPSIE, N.Y. Hudson Valley gas meet at city airport. Merchandise awards. Howard D. Clark, 205 Grand Ave.

June 8—BOSTON, MASS. Indoor events of New England Championship rubber meet, sponsored by Junior Aviation League. Trophies, trophies and more trophies. See April 6 note. Held in Boston Garden arena.

June 9—BOSTON, MASS. Outdoor events of New England Championship rubber meet. See preceding listing. Held at Harvard College practice field.

June 16—WILLIAMSPORT, PA. Pennsylvania championship gas meet at Williamsport airport, Montoursville, Pa. Trophies, plaques and merchandise. Dr. John L. Holmes, Jr., 339 Pine St., Williamsport.

June 16—PITTSBURGH, PA. Allegheny Mt. Area model club meet at Butler Airport. See April 28 note.

June 16—OKLAHOMA CITY, OKLA. Gas model meet all classes for cash prizes and High Point Visiting Club trophy. Carl Huddleston, 317 S.W. 39th St.

June 16—SACRAMENTO, CALIF. Superior Calif., Academy gas model meet at Mather Field. Flying course, airline trips and merchandise awards. A. R. Timberlake, 1841 Ceramay Way.

July—CHICAGO, ILL. National Model Airplane Meet sponsored by the Chicago TIMES in cooperation with the Park District. Application blanks and complete information will be available; watch for announcement in this magazine of where to write for complete information.

July 7—SALT LAKE CITY, UTAH. Class A gas meet at Central Airport for merchandise awards. See May 5 note.

July 13—BOSTON, MASS. Outdoor meet of Junior Aviation League. See April 6 note.

July 14—POUGHKEEPSIE, N.Y. Hudson Valley midsummer gas meet at city airport. See June 2 note.

July 21—OMAHA, NEB. Gas meet at Benson Park. Trophies, merchandise and cash. L. B. Bush, 610 Redick Tower Building.

July 28—BALTIMORE, MD. Baltimore Model Airplane Assoc. contest for rubber and gas at Municipal airport. Merchandise and trophies. George H. Geil, 1509 Abbottston St.

July 28—OTTUMWA, IOWA. Annual All-Iowa meet at Municipal airport. Gas and rubber for $200 cash, trophies and merchandise. C. P. Oleson, % Municipal airport.

August 10—BOSTON, MASS. Outdoor meet of Junior Aviation League. See April 6 note.

August 25—POUGHKEEPSIE, N.Y. Hudson Valley gas meet at city airport. See June 2 note.

September 1—SALT LAKE CITY, UTAH. Second annual Douglas Trophy gas model meet for all classes. See May 5 note.

September 8—WYANDOTTE, MICH. Indian City 2nd annual gas meet at Fort and Penn. Ave. field. All classes. See May 5 note.

BOSTON, MASS. Junior Aviation League meets on Sept. 14, Sept. 21, Oct. 5, Oct. 19, Nov. 2, Nov. 16, Dec. 7 and Dec. 21. See April 6 note.

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$7.50 *complete ready to run*

THE RUSH of inquiries and orders for the sensational new Brownie motor *proves* that many thousands of model builders have been waiting hopefully for Junior Motors Corporation to build a high-performance class B engine at a price *under* $10. Now, after months of long, careful research and experiment, Brownie at $7.50, *is* a sensation. Records are going to crash wherever Brownie goes into action.

Most powerful motor in B class, it has been possible to produce so excellent a motor for only $7.50 *because it is a product of the largest, most completely equipped miniature motor plant in the world.*

Brownie presents a *new* phase in engineering design and has a cubic inch displacement of .29 out of a possible .30 as specified in the N.A.A. rules for class B competition. Equipped with the Champion V-2 plug. May be inverted. Every Brownie is *factory-tested* and packed in the new *sealed container* to insure tamper proof delivery —another Junior Motors innovation!

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*Address*_____

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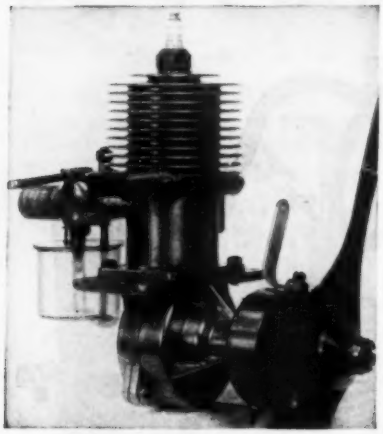
the SUPER "99",



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SPEED AND POWER

There is nothing like it (pat. applied for). In speed, range and flexibility it compares with the modern airplane motor! Run it at full throttle or any intermediate speed. No more changing of the gas adjustment or spark! You could not wish for a finer, more modern "C" class power plant. For reliability, easy starting and power you can't beat it.

Model "Super-99" is especially suited for

RADIO CONTROLLED PLANES

Let the radio controls operate the throttle!

Enclose 3c stamp for further details; ask for our new folder "C."

Here is news of a

BLESSED EVENT

The FORSTER "29",

the latest and newest "B" class motor! Forget all your previous conceptions of "B" class motors! This one is different in design and performance! It has all the proven old and many new and exclusive features. Its speed and power will amaze you. See it and hear it and you will agree that it is a step ahead of the parade.

Hold everything! You'll be glad you waited. For advance information write for folder "B."

FORSTER BROTHERS
519 Lake Street — Maywood, Illinois

A Flying Miniature Speed Winner

(Continued from page 19)

or collar, was soldered to the tube about 1/16th-inch from one end of the tube. This small projection of tube was then filed smooth and finished off to a bearing surface on a whetstone. The entire unit is then cemented into a hole drilled in the nose plug.

Cover the fuselage top at this time with a piece of 1/32nd-inch sheet balsa. Smooth the sheet with fine sandpaper and slightly round off the longeron corners on the top surface.

From the same stock, cut two pieces 1-1/2 x 1/2 inches and cement one on each side as shown in the drawings, these plates to act as wings anchorage surfaces. Take care to have the horizontal edges exactly parallel with the top longerons since these plates will act as incidence guides when the wing is attached later on.

Another piece of 1/32-inch sheet balsa, 1 x 1/2 inches, is cemented between the lower longerons behind the third bottom crosspiece. This member will strengthen the fuselage at a point where the landing gear is to be attached.

Front and rear landing gear struts are shaped from pieces of wire, six inches long. Number 8 wire is satisfactory for this job. Fit the front and rear legs according to the plans and trim off the excess length. Solder the lower ends neatly and add the 1/32-inch sheet balsa fill-ins. Use plenty of cement and thread neatly bound to attach the landing gear.

Two stringers, 1/32nd-inch square are cemented to each side of the fuselage, as shown. Five additional stringers are cemented to the fuselage bottom, running from the first to third crosspieces to help round out the front end. Cut and cement the 1/32-inch sheet "cowl" plates to each side of the fuselage, as indicated in the drawings, and the body itself is complete.

Tail surfaces have been made double-surfaced to reduce the drag of structural members as well as to reproduce the scale model effect as faithfully as possible.

First cement a rudder spar to the sternpost, taking care that it is perfectly perpendicular. This member is cut to length from 1/32-inch square balsa. Next cut the rudder outlines from 1/32-inch sheet in the sections and with grain as indicated in the drawings. These outlines should not be more than 3/32nd-inch wide. Cement the sections together on the drawings and while they dry turn to the streamline section behind the cockpit.

Cut formers B, C, and D from 1/32nd-inch sheet balsa, and cement each into its proper place. Former A and the adjoining center windshield former, the latter to be shaped according to the side view shown in the plans, are formed from Number 8 wire and cemented in position. Next cement the top stringer in place, attach and cement the rudder outline and align it with the rest of the ship. An additional stringer on each side will complete the headrest.

Rudder ribs are 1/64th-inch thick, slit from your 1/32nd-inch sheet stock. Cement the end of each rib to the outline. Remember to put a strip on each side of the frame. When dry, sand the rib ends lightly to provide a better entry into the airstream.

Construct the stabilizer in the same manner. The single spar is 1/32nd-inch square balsa set into a notch in the lower side of the upper longerons. This point is indicated by a black square in the drawings. Cement the outlines in perfect alignment and with 1/32nd-inch negative incidence.

The small wings of the Wittman racer are very efficient yet easily constructed. Cut the eight ribs from 1/32nd-inch sheet balsa stock. Two medium hard balsa spars are provided for, the front being 1/16th- x 1/18th-inch and the rear, 1/16th-inch square. Prepare a jig on the drawings to hold wings in alignment, running pins along the spars to keep them in place. When the ribs have been cemented to the spars, attach the 1/32nd- x 1/4th-inch trailing edge. Note that the trailing edge is notched to receive the tail of each rib.

Cement the 1/16th-inch square leading edge sections in place and add the tips. The latter are cut from 1/16th-inch sheet balsa, edges sanded round.

Rigging fittings should be made as shown in the drawings and cemented to their proper stations when the wing is dry enough to remove from the jig. Cement these fittings well so they won't pull out.

Carve the propeller from a block of medium hard balsa of the dimensions shown in the plans. The end view shows the pitch at the widest part of the blade, also at the tip before the final blade shape is formed. Work the blades to 1/16th-inch in thickness, sand lightly with coarse, then fine sandpaper, finishing the blades smoothly with the latter. Insert the prop shaft and cement it in place, testing it occasionally during the drying process to see that it does not wobble.

Remember, however, that if you have used a tubular bearing, which is highly recommended, the shaft must be inserted through the rear of the tube before attaching it to the prop. A small piece of thin aluminum should be cemented to the prop back where it comes in contact with the tubular bearing surface. At this point, sand the heavy blade until the prop balances perfectly.

Before covering your Wittman racer, dope all exposed balsa parts as follows: top decking three coats, side cowl plates, nose block, landing gear fill-ins and prop with five coats, a light sanding with fine sandpaper between each coat. This will impart a satin smooth finish to which colored dope adheres and dries with a hard gloss.

The original Wittman model was covered with red paper, including the fuselage top beginning at a point 2-3/8ths-inches from the back side of the nose block. Cover the top and sides from this point to the rear end first. Fuselage top foreward, the side plates, nose block and prop are painted silver. The entire bottom, to the nose block is covered with red paper and the landing gear is painted red.

When covering the wings remember to slit the paper over the wire fittings just enough to allow them to come through the surface. One coat of very thin dope may be applied to the wings and tail surfaces, taking care, of course, not to warp either. Give the papered surfaces of the fuselage two coats of straight dope.

Attach a pair of 1/2-inch diameter hard-

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Their flying ability and simplicity of construction have made them first in popularity throughout the country. Musketeer kits are complete (except for wheels and power plant), including the new three-color transfer insignia.

MUSKETEER "42" — $1.95 P.P.
42" Wingspan, for all Class "A" Motors

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54" Wingspan, for all Class "B" Motors

MUSKETEER "STANDARD" — $3.95 P.P.
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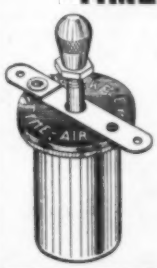

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The latest sail plane Soarer. Can be built easily and quickly. 5 ft. wing span. Tow line or rubber band launch. Proven duration 3 to 20 minutes, depending on air currents.

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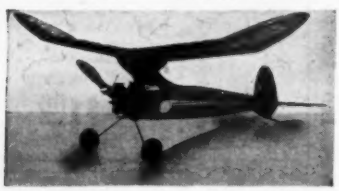

A high performance gas model. Wing span 44½ in. Length 30½ in. Wing area 2 sq. ft. Weight 20 oz. ready to fly. An easy-to-build champion you will be proud to own and fly.

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A streamlined beauty—a wonderful flyer. Wing span 6 ft. Length 46 in. Wing Area 5.28 sq. ft. Weight 3½ lbs. Kit is complete with all materials necessary to make this beautiful ship.

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The PEERLESS MODEL AIRPLANE Co.
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wood wheels. A drop of solder will suffice for a hub cap. The wheels should be painted black.

To assemble the Wittman racer, work from a level board, jacking up the fuselage until it is in flying position, the top perfectly horizontal. Test with a spirit level. Block up the wings until they have the required amount of dihedral angle, 1/2-inch under each tip.

When this assembly jig is ready, put a drop of cement on the butt end of each spar and press the wing lightly against the anchorage plates. The proper position for the wing is indicated by the incidence base line as shown in the side view plans. The black oblong and square on this line indicate the proper position for the spars.

Before the cement sets adjust the incidence according to this base line, and finally check one wing against the other, along both leading and trailing edges and at the tips, to be sure the alignment is correct.

When the wings have dried in position, attach the threads which represent bracing wires on the real machine. A drop of cement on each fitting after the thread has been tied will keep the rigging tight. A little cement where the thread passes over and under the fuselage will keep it in place. Check the dihedral once more, as there may be some droop and true it up with the threads.

Decorate your Wittman racer with the numeral "4" cut from air mail letter paper or other light white tissue, to the size shown. For realism, cover the windshield framework with cellophane. Finally, finish off the cowling with a pair of exhaust stacks made of 1/8th-inch square balsa half rounded, cemented in place and painted black. The three louvres on each side are painted on with black dope.

String up a two strand motor of 1/8th-inch flat rubber, without slack and try your racer for glide. It may be necessary to add a slight amount of weight in the nose to balance the ship. Small pieces of wire solder cemented inside the nose block will do the trick.

Properly rigged and balanced, this little ship will give a long, fast and flat glide, quite unusual for its size.

Oil or grease the thrust bearing and try a hand-wound take-off first, so the ship will take the air of its own accord when flying speed has been attained. It should climb steeply to an altitude of 20 feet or so, level out and glide to a true racing type landing! The photo printed here shows the actual climbing angle of the Wittman. The ship IS NOT stalling!

Flying capacity will be greatly increased when a winder is used. For flights of greater duration, try a one strand motor of 3/16ths-inch flat rubber or two strands (one loop) of 1/8 inch flat rubber. Though a scale model this little plane has all the characteristics of a contest speed model—thin wings, light weight and power.

Because of the small wheels, fly your Wittman racer over a smooth surface. Even small stones or ground irregularities will turn it over on its nose on landing, thereby spoiling one of its most true to life characteristics, a fast landing after a fast flight!

Frontiers

(Continued from page 15)

the front lines. Thus they will have long ranges as well as good maneuverability characteristics to stave off the attacking German fighters. The two latest fighting planes of Great Britain at this writing are the Boulton-Paul all-metal two-seater and the Blackburn Roc fleet fighter, both of which were test-flown several months ago. They boast of high speed as their main feature. The Boulton-Paul is equipped with a multi-gun turret behind the pilot's cockpit and has a wingspread of 39.5 feet and a length of 30 feet.

While all the war orders come flowing in and the manufacturers make a "counter attack" by speeding up production, news leaks out on many new aircraft. Brewster, for instance, who is delivering her mid-wing fighters to Finland, who has a later designed single-seater for the U. S. Navy and who is said to have orders from Great Britain, has ordered a couple of Menasco engines. That means new designs in the small plane class. Another big airplane manufacturer has also designed a sleek Menasco powered ship, of which more about later.

Jack Northrop, who has been very successful in organizing new airplane factories and in designing new aircraft, has also been very successful in keeping details of his new designs exclusively to himself . . . but we will wager that the first airplane to roll out the doors of Northrop's new plant at Hawthorn, California, will be a single-seater interceptor!

While Douglas begins work on forty DC-4 transports for the airlines, Consolidated goes through with successful test flights on her almost equally as large four-engined YB-24. Surpassing the B-17 by five feet, the YB-24 has a wingspread of 110 feet, is of high, mid-wing design with the engine nacelles flush with the top of the wing. The engines installed are Twin Row Pratt & Whitneys turning three-bladed propellers. The fuselage is of the stubby type with about as much of it forward as aft of the wing. The gun pit in the nose has at last been designed with enough space for the gunner to shoot and breath at the same time. The whole interior indicates that there are good accommodations for the crew, with even the tail gun pit under the elevators large enough for the mounting of a heavy .50 caliber gun. Small windows are scattered throughout the sides of the fuselage, denoting gun emplacements, and if the enemy pursuiter is good enough to get within striking distance of the YB-24 without being blown to "Kingdom Come," they should let him have the bomber!

The nose wheel of the tricycle landing gear fits snug in the nose of the fuselage and permits the giant warplane to rest close to the ground. Aerodynamically the Consolidated again amazes the engineering world with its Davis airfoil section wing which is even longer and thinner than that employed on the Consolidated twin-engined flyingboat, Model 31. The tail also resembles the Model 31 and that is one feature that we still do not like. The vertical tail surfaces, however, are very large. We have heard speeds quoted on this airplane from 325 and 365 on up to 400 m.p.h., but if appearance means anything we would say

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A BEGINNER CAN WIN! AN EXPERT WON'T BE SATISFIED WITH ANYTHING LESS

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Here is the long awaited Class "C" Ohlsson that brings climbing performance in the 6 and 7 foot Class "C" field of a type formerly associated only with Class "B" Models. Available for inverted or upright operation at no extra charge. Bore 15/16. Stroke 7/8. Displacement .60 cu. in. Complete, **$21.50.**

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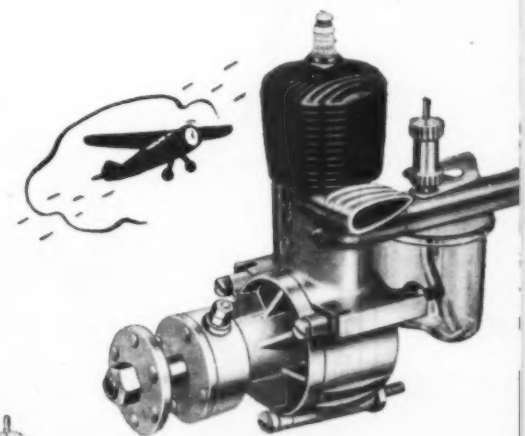
now offer you "Perfect Combinations" of matched models and Ohlssons for faster climbing and longer glide.

OF VITAL interest to every model builder is the fact that model designers throughout the country have designed their new faster climbing airplanes for the power of these 1940 Ohlssons. Here is the answer to the keener competition you may expect under the new N.A.A. rules. With quality you will recognize at the first glance, the new Ohlsson 60 Custom, king of Class "C" engines, and the sensational little "19" bring to their respective fields the typical Ohlsson performance responsible for making Ohlsson 23 the National Class "B" Champion. With their new matched airplanes, these Ohlssons will give the expert his greatest thrill, and even the beginner an edge over any *almost perfect* combination. See the complete line of Ohlssons and the new finer ships designed for them at your dealer's today.



OHLSSON 23—Recommended by more model designers than any motor last year, Ohlsson 23 was the outstanding competitive motor of the year. No motor in model history has approached its record of taking the first 10 places in Class "B" and Class "B" Open events at the Nationals. Complete, **$16.50.**

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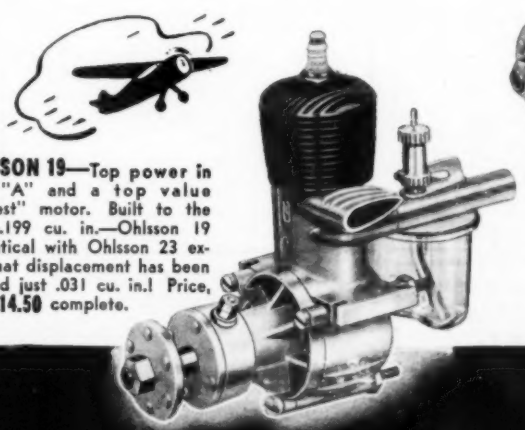

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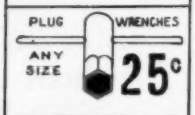

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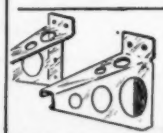
VALVOLINE OIL SAE 70

.10c



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OHLSSON "23"

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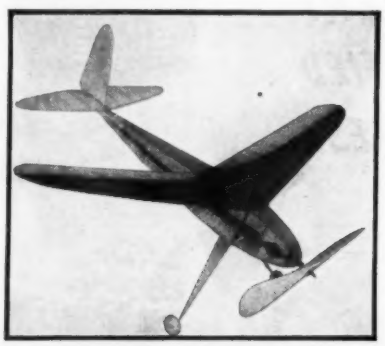

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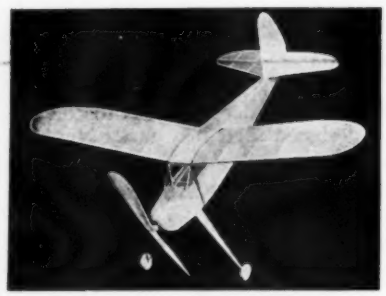

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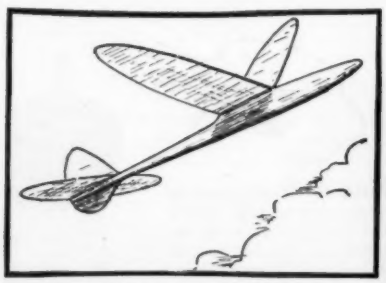
40 in. model, same ship as Pacific Ace, add 10c postage **50c**

W. R. Butterfield of Los Angeles made a flight of 2 hours and 40 min. with his Cloud Haunter.



CLASS "B" ALL-BALSA GLIDER

Class "B" all-balsa Glider is easy to build and a honey to fly. Add 10c postage **25c**

MODELCRAFT SOARING GLIDER

(Towline Glider)

31½" Soaring Glider has turned in many flights of better than one hour. Kit complete. **Add 10c Postage** **25c**

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A practical and durable commercial model. Easily constructed from well drawn and detailed plans. Kit contains an ample supply of first grade wood and high quality cement. Comparable with and outflies most dollar kits.

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THE CHAMP

Wing Area 191 sq. in.

The name Champ tells the story. It will outfly any model in its class. The kit is complete, nothing else necessary to build and fly the model. Includes free wheeling unit, plenty of rubber, rubber lub and the best balsa you've ever seen. Add 10c for postage **$1.00**

SUPER HIGH WING 30 in.

A companion model to the Pacific Ace. Just as sweet a flying ship. Kit is complete. **Add 10c for postage** **25c**

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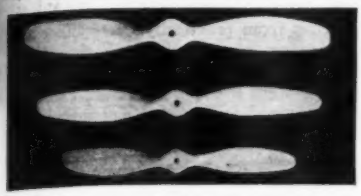
THE LEADING SUPPLY HOUSE OF THE WEST

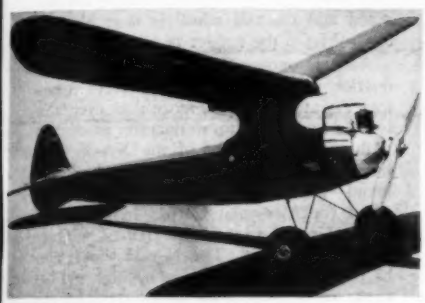
LOOK!

D-G GAS MODEL PROPS



Machine made from straight grain hard wood. D-G props have shown from 20 to 30% more thrust in every test than any other prop. The most convincing test is to put one on your ship and see it climb faster than it ever climbed before. Sold by all dealers and distributors who want to give you the best.

Stock up now. Complete range of sizes, 9" 10" 11" 12" 13" 13½" 14" each **25c**



INTERCEPTOR—CLASS "B"

World's fastest climbing model. Engine for engine, this ship will grab nearly twice as much altitude with the same engine run. Power with, Ohlsson 23, Ohlsson 19, Brown Brownie, Bantam, HiSpeed Bullet or Torpedo, or similar engines. Wing span 46" chord 7". Kit contains cement, dope, covering, all printed parts, bent landing gears, turned aluminum cowl, and Gas Model Airwheels. Price..... **$2.95** POSTPAID

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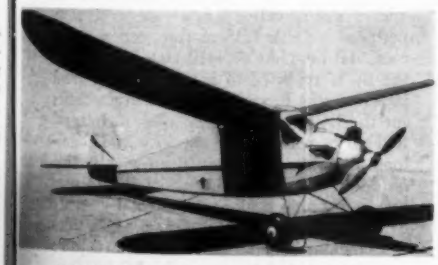
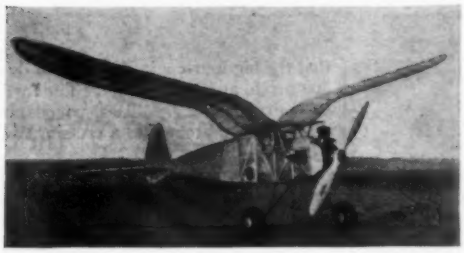


SKY BABY—CLASS "B"

Designed for Class "B" engine such as Ohlsson 23, Torpedo, Junior Motors Brownie, this model in its test flights did 15 minutes on a 12 second engine run. Has taken many firsts, including the recent Fresno contest. Wing span 54", chord 7". Kit complete with cement, dope, covering, formed landing gear, air wheels, spun aluminum cowl, etc..... **$3.85**

PLANS ONLY 25c



SPOOK—CLASS "A" or "B"

Class "B" Performance in a Class "A" Ship

Specifications: Flying weight with Ohlsson "19", 18 oz. Wing loading 8 oz. to the square foot. Span 48". Can be flown as Class "B" with Ohlsson "23", Hi-Speed or Brownie. Kit complete with cement, dope, covering and wheels..... **$1.50**

MISS TINY—CLASS "A"

May now be flown in two classes. After winning many places in Class "B," including second in the 1939 National Meet, Tiny may now be powered with Ohlsson 19, Bantam, Madewell Mite and other such engines for Class "A." Watch the Tinys take another string of firsts, seconds and thirds in 1940, and watch the present Class "A" records fall to Miss Tiny's superior performance. Get a Tiny and start collecting first place hardware for yourself.

Wing span, 46". **DeLuxe Kit** contains spun cowl, silk, 2½" Voit Air Wheels, cement, dope, die-cut ribs, plenty of good balsa, and full size plans.

Price..... **$3.95**

STANDARD KIT same, but with bamboo paper covering..... **$2.95**

DRY KIT complete except for wheels, covering, cement and dope **$1.95**

PLANS ONLY 25c

PACIFIC ACE—CLASS "C"

66 in. tapered wing. DE LUXE KIT contains tapered spars, beveled and tapered trailing edge, die-cut ribs, turned aluminum cowl, 1 qt. gas dope, 1 pt. cement, 3½ yds. super silk, formed landing gear, 4½ in. inflatable air wheels, dural wire, alum. tube, washers, bolts, haskalite, dural sheet, hook up wire, switch, selected hard balsa, full sized, black and white, plans with test flight instructions, complete..... **$8.50**

STANDARD KIT with bamboo paper, ½ pt. of dope, 1 pt. of cement and 3½ in. air wheels..... **$6.25**

DRY KIT same as above without cement, dope, silk or wheels **$4.75**

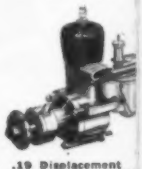
PLANS ONLY 50c

MODELCRAFT MOTORS

BROWN Class "C"

Model "D" $12.50
Model "C" $18.50
Model "B" $21.50
Model "M" $16.50
Post Paid

OHLSSON "19" Class "A"

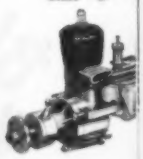


.19 Displacement Just right for M Tiny ..... $14.

JUNIOR MOTORS BROWNIE Class "B"

.29 Displacement $7.50
Orders will be filled in rotation as soon as deliveries start.

OHLSSON "23" Class "B"



.23 Displacement Just right for S Baby ..... $10.

TORPEDO Class "B"

Displacement .30 cu. in. 1/5 H. P. 8,000 r.p.m. with 12 in. prop.... **$16.50** Post Paid

OHLSSON "60" Class "C"

.60 Displacement For your Pacific A ..... $21.

HI-SPEED Class "B"

1/7 H.P. 6500 R.P.M. Weight bare 3½ oz. Runs upright or inverted; fully assembled, complete with coil and condenser.

$12.75 POSTPAID

ATOM Class "A"

Bore ½"—Stroke ½ Weight 2 oz. $12.

A "HOT IRON"

SPEED KING

Gas Model Racing Car. Sleek, powerful looking, cast frame, transverse springs, oilite bearings, special racing wheels, kit ..... **$15.**

CRAFT

7306 SO. VERMONT AVE., LOS ANGELES, CALIF.

When Bud Warren takes off he gets altitude in a hurry. Proves there is real power at his finger tips.

BUD WARREN Says:

"It's a snappy take off and rapid climb that makes model flying the fun it is nowdays. When I go out to the flying field I expect and get pursuit job performance."

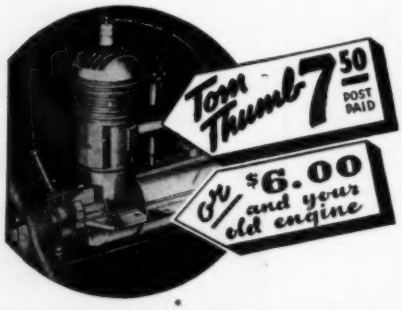
"They can argue about proper airplane design but when the wheels leave the ground and until the timer cuts it's engine performance that counts."

"Tom Thumb owners know the thrill of this kind of flying. They write to say the Tom Thumb is no ordinary engine. Many are amazed to find the Tom Thumb gives performance they were led to expect only from a high priced engine."

"With the Tom Thumb it's not the cost that counts. I block test and run in every motor at peak speed and make sure each Tom Thumb earns me a new friend."

SPECIFICATIONS and HOW to BUY the NEW TOM THUMB

The Tom Thumb is the most powerful easy starting 1/5 H.P. engine made. Clip the coupon below, enclose money order for $7.50 (also your old motor for special $6.00 offer), and receive a *brand new* assembled and block tested Tom Thumb. Complete with fuel tank, coil, Champion spark plug, one piece cylinder and head and other modern features. Complete flying weight 10 oz. (less batteries). Bore 7/8"; Stroke 3/4".



WARREN SALES & SERVICE
412 Brett St. Inglewood, Calif.

☐ Rush me one new Tom Thumb Engine. I enclose $7.50.

☐ Rush me one new Tom Thumb Engine. I enclose $6.00 and my old engine (any make) including all parts regardless of condition.

I intend to run my Tom Thumb— ☐ Upright ☐ Inverted

Name .....

Street .....

City ..... *State* .....

that the big four-engined craft will do about 300 m.p.h. as its "near best." Time will tell. The airplane weighs 40,000 pounds, carries 4 tons of bombs and has a cruising range of 3,000 miles.

Going from one extreme to the other, we see as our second plane of the month the North American NA-35 training plane. The big news is that England contemplates buying 1,600 of these low-wing, all-metal North American creations. The NA-35 is by far the nearest airplane yet to approach the mass production stage. Its features that lend to fast production are its sparless wing, monocoque sheet metal engine mount, full monocoque all-metal fuselage, full cantilever tail surfaces, North American's own designed landing gear and other smaller items such as stub wing tips and use of forgings and castings.

The airplane was originated, designed, built and flown within five weeks! Vance Breese, noted West Coast test pilot, has completed test flights on the NA-35 with a 165 hp. Menasco engine installed and may later test the ship equipped with a 175 hp. Ranger engine. Test reports indicate perfect stall control with flaps either up or down in stall conditions, a good characteristic for a military training ship for which purpose the plane was designed. Following are the specifications:

Engine: Menasco C4S-2, 4-cylinder, inline; Engine Rating: 150 hp. at 2260 r.p.m. at 3,000 ft.; Take off Rating: 165 hp. at 2260 r.p.m.; Overall Span: 29 ft. 8-7/8 in.; Length Overall: 25 ft. 6 in.; Height Overall, Tail Down: 9 ft. 4 in.; Wing Area: 148 sq. ft.; Design Gross Weight: 1760 pounds; Fuel Capacity: 24 gallons; High Speed: 140 m.p.h.; Cruising Speed, 75% hp.: 125 m.p.h.; Landing Speed with Flaps: 48 m.p.h.; Maximum Rate of Climb: 900 ft./min.; Service Ceiling: 18,500 ft.; Endurance, 75% hp.: 2.46 hours; Range, 75%: 305 miles.

Art Chester, noted race plane designer, builder and pilot and who at one time was also associated with the Menasco company, engineered the engine installation on the NA-35. Therefore it is not surprising to see an engine installation on the NA-35 similar to that used on Art Chester's spectacular "Goon." The air as usual is taken in at the nose under the spinner and sent through a scoop on the right side of the engine. From there the air is forced between the baffled cylinders and through outlet louvers on the left side of the engine compartment cowling. The power plant is attached at four rubber-cushioned points on the full cantilever, monocoque, aluminum sheet metal structure which forms the top of the fuselage nose. The use of this type of engine mount provides unobstructed access to the engine, lighter weight, added strength and improved vibration characteristics. The one-piece engine cowling drops down from the mount, leaving the entire engine exposed for servicing.

Two bulkheads, a few formers and two hat-shaped stringers running partly down the side of the fuselage make up the entire internal structure, the main portion of the loads being taken by the sheet metal monocoque skin. The open cockpits are in tandem with a small streamlined turn-over truss between them.

Being of the primary trainer type for the use of pilots making their first flight into the air, the airplane had to be designed for smooth and easy flying qualities. Thus the design of the wing becomes an important factor more so than ever and, on the NA-35, differing from practically every other airplane flying today an NACA Series 4416 R at the root and 6409 R at the tip airfoil sections were used. These have cambered lower surfaces and a swept-up trailing edge. The convex and concave contours undoubtedly add to the rigidity of the wing structure. A monospar is incorporated in the wing between the rigid landing gear legs, but the outer wing panels contain no spars with only a few ribs and stringers as internal structure. The slotted ailerons, like the elevators and rudder, are metal covered. Plain slotted flaps are employed.

The landing gear has an extremely wide tread of 100 inches. The strut and brake controls are enclosed in a new type hinged fairing which permits inspection of the entire assembly without removal of the fairing. Individually controlled brakes are provided and the tail wheel is steerable with control from the rudder pedals.

Already outstanding for setting new production records during 1939, North American Aviation, Inc., is, more than ever, able to hold its leadership in quantity production with the development of the NA-35. The trim little airplane is destined to be in demand—the new CAA civilian training program, the Army Air Corps, Great Britain's Civil Air Guard and the Allies' military training program. The NA-35 should also be popular among sportsmen pilots and because of its simplicity of construction the price should be well within the means of the private owner.

In the first issue of North American's new quarterly publication, "Skyline," is briefly described their three new trainers for the Air Corps and the purposes which they will serve. An abstract follows:

"The BC-1A basic combat airplane has fully retractable landing gear, while the BT-14, a basic trainer, incorporates fixed gear. Both models will use an aluminum alloy semi-monocoque rear fuselage section. External sheet metal surfaces will be 'alclad' exclusively. A newly designed wing with an NACA 2215 airfoil section at the root and an NACA 4412 airfoil section at the tip is reported to have effected a great improvement in stall control characteristics for the BC-1A and the BT-14. . . . Integral fuel tanks with a total capacity of 178 gallons are incorporated in the center section on Model BC-1A. The model BT-14 uses two removable tanks with a total capacity of 104 gallons. Various new air corps developments in engine cowling and baffle design are being tested on the BC-1A.

"It is understood that the BC-1A will be used primarily for command liaison and command reconnaissance, to which functions it is excellently adapted by its maneuverability, sturdiness of construction, ease of control and comparatively short take-off and landing distances. It was also indicated that a number of the same type, with slight modifications, will be identified by the air corps as Model AT-1 (designation recently changed to AT-6) and used for advanced training, the stage between the achievement of proficiency on slower training ships and handling first-line fighting craft, a difficult

ARE YOU GETTING "SPRING FEVER"?

At this time of the year on racing tracks, flying fields and lakes, thousands of enthusiasts are having the time of their lives with gas powered models. Many valuable cash and merchandise awards will be presented. And don't forget—with a .57 Cu. In. DENNYMITE powering your model *you have the best chance of becoming a winner.* DENNYMITES SET THE PACE!

SPECIFICATIONS—Displacement .57 cubic inch—bore 9/10—stroke 9/10—two cycle ¼ **horsepower at 6500 r.p.m.** Height overall including spark plug 4½ inches. Length overall 5".

DE LUXE AIRSTREAM
Complete with coil, condenser, Dural motor mounts, De Luxe long exhaust and exclusive spring choke..... **$17.85** postpaid

STD. AIRSTREAM
Complete with coil, condenser and short exhaust stack **$15.85** postpaid

AIRSTREAM UNIT
Same as Standard Airstream less coil and condenser.... **$13.85** postpaid

The New

"DE LUXE" MERCURY MIDGET RACER

NEW "DE LUXE" MERCURY MIDGET
Rear wheel drive—All metal body complete, prefabricated, machined and polished, ready to assemble—Drive unit gears run in oil in totally enclosed housing. Kit (less flywheel and motor) **$23.50** postpaid

ORIGINAL FRONT DRIVE CAR KIT
Case hardened steel gears completely enclosed in aluminum housing, cast aluminum frame and all materials necessary, including detailed plans for constructing body. Kit complete..... **$19.50** postpaid

Can be assembled ready to run in **2 HOURS!**

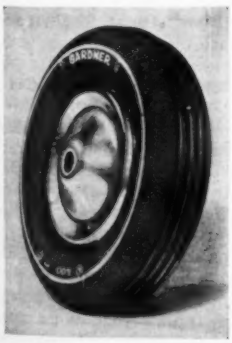
WORLD'S SPEED RECORD

Notice how DENNYMITE powered Mercury Midgets are predominating on all fast tracks. This winning combination holds the official world record of 62.23 m.p.h. (On Sunday, Mar. 3rd, Tom Dooling with his Dennymite powered "De Luxe" Mercury Midget turned the new paved track at Van Nuys, Calif., at 64 m.p.h.—the fastest speed ever recorded by any miniature racing car!)

EXCLUSIVE FEATURES OF "DE LUXE" MERCURY

Rear wheel drive—Cast aluminum frame, machined and polished, with X member for rigidity—Chassis mounted on 4-coil springs with rubber snubbers—*All metal body complete, pre-fabricated, machined and polished ready to assemble.* Four heavy duty radius rods, ball and socket type I-beam front axle.—Drive unit includes case-hardened steel gears running in oil and completely enclosed in aluminum housing.—Car furnished completely machined and ready for assembly (less flywheel and engine).—Car is perfect scale model of most modern miget race cars.

The Original **MERCURY MIDGET**



GARDNER RACING WHEELS

With the Gardner racing wheel two sizes, 6.00 x 17—approximately 3⅝" and 6.75 x 17—approximately 4", a scale effect is obtained, as nearly all midget racing cars use larger wheels on the rear. For a higher gear ratio 4" wheels on the drivers will give greater speed. Polished chrome plated wheels, bronze bearings for standard ¼" axle, racing type rib tread, finest tread rubber obtainable. Tires are locked to wheels.

6.00 x 17..... **$1.10 each**
6.75 x 17..... **$1.25 each**

DENNY ACCESSORIES
FOR RACING CARS

Flywheels, 8 oz.	$1.00
Special Flywheel, 16 oz.	$1.50
General Batteries, ideal for racing cars—3 sizes	25c—50c—75c
Aluminum Exhaust Pipes	$1.25
Special Exhaust Pipes for ported motors	85c
Dummy Pumps	$1.00
Steering Wheels	65c

DEALERS: Are you getting your share of the rapidly increasing Dennymite business? Write for new catalogue (just out) with Dennymite details and complete line of model supplies. You can now get Dennymite motors from all leading jobbers and distributors.

REGINALD DENNY INDUSTRIES, INC.

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THE NEW Bremer WHIRLWIND MODEL RACER

Sensational Winner right from the GO

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ALREADY ACCLAIMED THE GREATEST OF ALL ENGINEERING TRIUMPHS IN MODEL RACING!

Model racing fans who have witnessed the Whirlwind in action through scores of vigorous tests have hailed it as the latest and greatest boon to this breathtaking sport.

No wonder the new Whirlwind is making such a big hit. It has been perfectly designed in every detail **by men with practical experience in the model racer field.** See Whirlwind's many "FIRSTS": **First** in transverse spring action to keep car under control. **First** in low center of gravity to keep it hugging the track. **First** in Special Formula Aluminum castings for added strength. **First** in motor guard casting below radiator grill to protect engine. **First** in new style wheels and tires for extra speed, extra safety, extra wear. **First** in beauty; **highly polished** aluminum body with authentic scale designing to conform with AMRCA standards.

COMPARE THESE SPECIFICATIONS OF THE WHIRLWIND

Wheel Base, 12¾". Overall length 18". Special Formula Aluminum castings designed for stamina and strength. **No machining, no drilling necessary.** Extra strong "X" braced polished frame.

All Aluminum 1-piece body, **HIGHLY POLISHED,** with built in instrument panel.

Polished radiator grill, motor guard and drip pan. Perfected **transverse** spring suspension.

Rear wheel drive with hardened steel, 2 to 1 ratio Boston gears in enclosed drive housing, running in oil. Direct drive through ball universal joint.

NEW TYPE wheels and tires with low cost replacement feature. Front wheels, 3⅝" diameter. Rear, 3⅞" diameter. 8⅛" tread. Bronze wheel bearings. Strong shock proof front axle, adjustable for steering. Adjustable radius rods.

Kit comes complete with assembly drawing and all necessary hardware.

YOUR WHIRLWIND IS READY FOR SHIPMENT ORDER TODAY!

Get in on the fun of model racing that has spread like wildfire from tens, to hundreds, and now to thousands of model hobbyists. And, remember, there's many an extra thrill in having a Whirlwind. Assembly time of the Whirlwind is cut to a minimum by accurate casting and machining of parts and simple alignment and assembly features. In less than two hours you can have the Whirlwind assembled and running. Fill in coupon now. Mail it today.

Lowest Price in Top Quality Racers

$19.50 Postpaid

Complete, Less Fly Wheel and Motor

H. F. AULER COMPANY
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Milwaukee, Wisconsin

H. F. AULER CO., Dept. MA-50
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Gentlemen:
Please send immediately your sensational New Whirlwind Model Racer Kit. I am enclosing
☐ Money Order ☐ Check for $19.50 in full payment.

Name .....

Address .....

DEALERS JOBBERS Wire or write at once for favorable trade terms and sales helps on the Whirlwind.

transition problem because of the wide difference in flight characteristics, speed and furnishings of the two types. The Model AT-6 will supply air corps cadets with a close approximation of flight characteristics of service type ships, yet will incorporate safety and control features not possible on the latter. The BT-14 is the latest air corps basic trainer . . . for instructing its pilots after the primary training stage."

"Skyline" also states that 600 NA-66 trainers similar to the BC-1A are being built for Great Britain and 200 NA-64 trainers similar to the BT-14 are being built for France.

Measuring only two and one-eighth inches longer in span than the NA-35 is Ryan's new PT-20 for the Air Corps. Much like the former ST Ryans, the PT-20 has enlarged cockpit cutouts. This was done by moving the top longerons to the outside of the metal fuselage skin around the cockpits. Though originally designed as a fast sport-plane and not a primary trainer, the plane, equipped with the same Menasco engine developing 150 hp. normal rating and 165 at take-off, has a performance comparable to the NA-35, as follows:

High Speed: 142 m.p.h.; Cruising Speed: 136 m.p.h.; Rate of Climb: 975 ft./min.; Range: 326 miles; Service Ceiling: 18,600 ft.; Landing Speed: 54 m.p.h.; Gross Weight: 1600 pounds; Wing Area: 124 sq. ft.

And following are specification on Timm's contribution to the light training plane class:

Span: 35 ft.; Length: 26 ft. 4 in.; Height: 7 ft.; Airfoil Section at Root: NACA 23015; Airfoil Section at Tip: NACA 23013; Gross Weight: 2,125 pounds; Engine: 160 hp. Kinner; High Speed: 137 m.p.h.; Landing Speed: 48 m.p.h.; Rate of Climb: 1,026 ft./min.; Service Ceiling: 17,800 ft.; Range: 500 miles.

The Timm low-wing, open cockpit trainer is another contender for the rapid manufacture of aircraft, but it is problematical if it will be able to be produced as fast as North American's NA-35. The wing and fuselage skin on the Timm are of molded phenol resins (Bakelite), the bottom and top halves of the wing being laid on the wood wing structure and sealed together and the fuselage halves are sealed together to form a moncoque fuselage. Howard Hughes has an interest in this process, known as Nuyon.

With an orgy of new lightplanes coming into being, it is rather difficult to keep track of them all. Piper's new three-place ship is being demonstrated on the West Coast already. Interstate Aircraft, the people who make aircraft parts for most western airplane companies, is considering entering the lightplane field and do not be surprised to see the famed Roger Q. Williams put one on the market soon.

The Vought-Sikorsky Aircraft Division of United Aircraft Corporation has announced that a new scout observation airplane, designed to meet the high performance requirements specified by the U. S. Navy for this class airplane and which has been undergoing several years of research and development, has completed flight tests on land and sea.

Designated as the XSO2U-1, the two-place airplane is a mid-wing, convertible type monoplane in which attention has been focused on maximum speed and visibility without compromising the other desired factors of low landing speed, excellent water handling qualities as a seaplane, notable climb and endurance, and economical operation.

It is believed that a sound solution to the basic requirements has been attained in the XSO2U-1 by employing: a full cantilever wing and tail group, and sleek streamlining to meet high speed requirements; a swept-forward and highly placed wing, together with optimum crew spacing, to provide maximum visibility; deflector plate flaps and "drooping" ailerons for low landing speed with minimum wing area; and placement of the fuselage close to the float, thereby lowering the center of gravity and giving highly superior water handling characteristics.

Equipped with a 12-cylinder Fairchild Ranger "Vee" type air-cooled engine, developing approximately 450 horsepower at altitude, and a Hamilton Standard constant speed propeller, the airplane is of an exceptionally clean design. This has been made possible by the small frontal area of the fuselage, the use of resistance welding and flush riveting on all external surfaces, application of the Vought-Sikorsky smooth fabric-attaching method where fabric covering is employed, the fitting of gap covers ahead of the deflector plate flaps, and utilization of a new design streamlined float having considerably reduced air and water drag.

Compact, sturdy, and lightweight, the XSO2U-1 has been designed to withstand the severe conditions encountered at sea in rough water landings, as well as to meet the problems of handling both ashore and aboard ship.

Measuring approximately 36 feet in length as a seaplane and 34 feet as a landplane, the fuselage is of all-metal Vought-Sikorsky type monocoque construction. It includes two cockpits, one for the pilot located ahead of the leading edge of the wing and the other considerably aft of the trailing edge, an arrangement providing almost ideal vision for both crew members.

Interchangeable float and land type landing gears make the plane convertible. The main float is of the pointed, faired step design and is braced to the fuselage by two short full cantilever struts. Single, cantilever struts attach the wing tip floats to the wing. For conversion to a landplane, a split axle type landing gear can be installed in a short time.

The 38-foot wing is a single spar-leading edge torque box type full-cantilever structure consisting of a center section and two outer panels, the latter of which can be folded back alongside the fuselage. The leading edge of the wing is metal-covered, and the aft portion is fabric-covered, while the wing tips are protected from damage by rubber "bumpers." Deflector plate flaps are fitted to the trailing edge of the wing inboard of the drooping type ailerons. The tail surfaces are of the full cantilever type. Fixed surfaces are metal-covered and movable surfaces are fabric-covered.

Weighing approximately 5,200 pounds as a landplane and 5,500 pounds as a seaplane, the airplane is designed primarily for catapult operation from the navy's cruisers.

COMPLETE KIT

$4.95

ASSEMBLED

$9.95

REAL ENGINE VALUE—$4.95

Here is your opportunity to buy a kit of the famous G.H.Q. Gasoline Motor. ABSOLUTELY COMPLETE—ALL MACHINING DONE—READY TO ASSEMBLE. All you need is a screwdriver. No mechanical knowledge required. BUILD YOUR OWN ENGINE AND SAVE!!

AN ENGINEERING TRIUMPH . . .

Never Before at So Low a Price!!

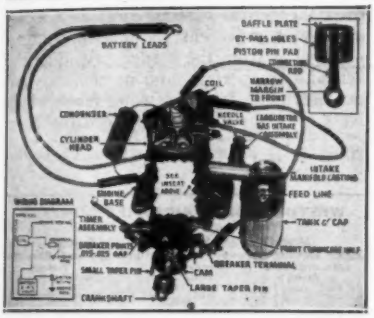
Indeed an engineering triumph—accomplished by outstanding G.H.Q. designers and engineers, who have constructed into the G.H.Q. motor everything that years of exhaustive scientific aerodynamic research could produce—geared to the highest possible degree of perfection. But more than that, the acid test . . an overwhelming response. Thousands of users in all parts of the country are praising, recommending, and endorsing this scientific achievement. It seems as if everyone in America wants one. The most hair-raising thrill you've ever experienced will be yours with the G.H.Q. motor—actually one of the most powerful motors ever constructed. Has broken records for amazing performance . . . and just imagine—flies model planes up to 10 foot wingspread. AND JUST AS EFFICIENT FOR BOATS, MIDGET CARS AND STATIONARY USE. Easy to start and simple as ABC to assemble.

Everything is in the kit including Champion spark plug, coil, condenser, tank and cap, ignition wire, cylinder, piston, connecting rod, timer, crankshaft, all screws, nuts, bolts, complete instructions, etc. Every part is fully machined and finished. No oil, gas, batteries, or propeller included. A SCREWDRIVER IS THE ONLY TOOL YOU NEED.

EXACTLY THE SAME PARTS THAT GO INTO THE G.H.Q. ASSEMBLED ENGINE

ALL PARTS GUARANTEED

Average Assembly Time 30 Minutes



THE ONLY ENGINE WITH A WARRANTY—APPLIES TO BOTH ASSEMBLED ENGINES AND KITS

Over 7000 of these same famous G.H.Q. Gasoline Engines have been sold at $8.50. Mass production methods and enthusiastic reception have enabled us to reduce the price from $35 originally TO THE NEW LOW PRICE OF $4.95.

The new 1940 model now for sale includes the new unbreakable steel stamped piston giving high and perfect compression, drop forged one-piece crankshaft, extra long bronze bearing, etc.

SPECIFICATIONS

4 Port 2 Stroke Cycle. ¾" Stroke. 15/16" Bore. 300-7,000 R.P.M. Turns 14" Prop. 8" Pitch. Bearing Surface, 1¼" Long. Crankshaft, 5/16" Diam. Weight, 10 oz. (Motor) Rotation, Either Direction. Height, 4½"—Width, 2½", H.P. Approx. 1/5th.

G. H. Q.'s SIXTH YEAR!

Thousands of Satisfied Users! Read some of these testimonials on file with us:

J. B., Providence, R.I.—"A few weeks ago I received the G.H.Q. motor kit and it is running perfectly. I hope to write you soon and tell you about some excellent flights."

R. H., Prairie du Chien, Wis.—"Your motors sure can take a lot of abuse and knocking around and yet perform perfectly. I have had two in a period of about two years and have seen higher priced motors give less service and performance."

W. W. M., Russellville, Ark.—"I received my G.H.Q. Motor Kit and am very well pleased. I had motor together in 1 hr. 40 min. I will place order next week for G.H.Q. Sportster Kit."

W. L., Claysburg, Penn.—"A wonderful motor that thrills any air-minded person. Strong and neat looking. As good as motors costing twice as much."

A. K., Hillside, N.J.—"I still can't understand how you can put such a dependable and rugged engine on the market at such a low price."

E. T., Sayville, N.Y.—"Received my G.H.Q. Kit okay and am more than delighted with same. You've got 'em all beat for price and performance."

R. P., Hamburg, N.Y.—"I want to extend my personal thanks to G.H.Q. for their prompt service. The motor I ordered was received within 24 hours. Such service cannot be surpassed. I also want to say that I have the motor running perfectly. I shall do all I can to help promote the success of G.H.Q."

H. H., Midlothian, Ill.—"Motor assembled correctly and performs perfectly. I am fully satisfied."

Ten Booklets on Miniature Gas Engine

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For gas engine operators who wish to become better acquainted with their hobby, G.H.Q. presents ten booklets covering the major points of miniature engine theory and operation.

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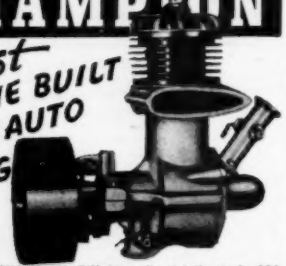

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Gross Weight (Fully Loaded), 38,000 lbs.; Overall Length, 75 feet; Height, 19 ft., 2 in.; Wingspan, 108 feet; Fuel Capacity, 1,000 gals.; High Speed, 243 m.p.h.; Cruising Speed, 210 m.p.h.; Rate of Climb (at sea level), 1,440 feet/minute; Single Engine Ceiling, 13,000 feet; Passengers (Day Version), 36; Passengers (Sleeper Version), 20; Passengers (Club Version), 30; Cargo (Mail, Express, etc.), 5,200 lbs.

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Designing Gas Models for Performance

(Continued from page 25)

Fig. 8 is a chart for determining the maximum L/D for any model. It is read exactly in the same manner as Figs. 6 and 7. For our sample model, with $l_p = 33.7$ and $l_s = 0.108$, the maximum L/D is read as 15.7. It will be found that usually the L/D will be lower for most models. The Aristocrat was designed specifically for high L/D, since it was designed in the days of fifteen-minute motor runs, when rate of climb and sinking speed were not as important as covering a lot of territory in a hurry.

For any airplane there is a certain simple relation between the airspeed for minimum sinking speed and the airspeed for maximum L/D. To determine the airspeed for maximum L/D, called V_{LD}, it is only necessary to multiply V_s, the airspeed for minimum sinking speed, by 1.32. This means that at all times V_{LD} is 1.32 times as much as V_s. For the Aristocrat, our sample model, we get V_{LD} by multiplying V_s, 15.6 m.p.h. by 1.32. From this, $V_{LD} = 1.32 \times 15.6 = 20.6$ m.p.h.

This completes the performance analysis of the gas model, with the exception that we must check upon some of the figures obtained. One good check is to determine the theoretical time of flight on a twenty-second motor run. Since almost all important contests are being run off under the twenty-second rule, it has become obligatory for the model builder to make his designs for that type of contest.

The determination of the time of flight on a theoretical basis is simple. The answer will represent the maximum time obtainable from the model, providing the settings are perfect, and no thermals are present. The formula, using terms which have previously been explained is: $T = 20 + \frac{C_h}{3\ V_s}$. In the equation, C_h is the

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maximum rate of climb, V_s is the minimum sinking speed, and T is expressed in seconds of duration. The logic of the equation is immediately apparent without explanation, since $\frac{C_h}{3}$ represents the altitude reached after a 20-second motor run and when divided by the sinking speed, gives the time of glide. For the sample model, $T = 20 + \frac{350}{3x1.67} = 20 + 69.7 =$ 89.7 seconds, or 1 min., 29.7 sec. (Approx. 1-1/2 min.)

As stated before, this time of 1 min., 29.7 sec. can be obtained in thermal-less weather only if adjustment is perfect. Of course, adjustment of the gas model is entirely independent of the design of the gas model. That is, first the gas model must be designed to obtain the desired performance, then the adjustment determined by theoretical and experimental means.

Up to this time, we have discussed only the performance of the model after it has been designed. In Article No. 1 it was pointed out that design is merely a series of successive approximations, with each succeeding approximation making the performance of the model closer to the performance originally required. Let us now apply this principle to the Aristocrat, the sample model. We will apply several successive changes to the design of this model and list the changes in the form of a table, showing successively how the various changes affect the performance. In this way, you will be able to follow the same trend when designing your model, should its calculated performance fail to come up to expectations. Naturally, the object will be to get as great a duration under the 20-second rule as possible.

The table of comparative performances gives a good deal of other information in addition to the effect on performance of certain design changes. In Fig. 9, notice that for each specification of the model, the corresponding units, symbol, formula and chart solution of the formula are given. For instance, the power loading, whose units are pounds per horsepower, symbol l_t, and formula $l_t = \frac{W}{n \times h.p.}$ is given in the first horizontal column. The rest of the specifications are listed in the same manner, running in horizontal columns.

The last five vertical columns are tabulations of the changes in specifications and performance with certain design changes. In the first column we find listed the performance we have determined in these two articles. Running all the way down, these are repetitions of the figures previously determined. In the next column, the performance of an airplane exactly like the Aristocrat, with the exception of two changes, is listed. On this airplane the weight has been cut down to five pounds, making the wing loading ten ounces per square foot and decreasing the span to seven feet, but keeping the area constant by decreasing the aspect ratio from ten to six.

Now this is *VERY IMPORTANT* Notice that for the new design, the sinking speed has been *INCREASED* from 1.67 to 1.87 feet per second, while the rate of climb has increased tremendously, from 350 to 501 feet per minute. This indicates a little-realized fact; namely that aspect ratio, or more important than that, *SPAN LOADING* is of prime importance in determining sinking speed. Follow across on the horizontal span loading and sinking speed columns. Notice that increase in span loading increases sinking speed, just as decreases in span loading affect decreased sinking speed, and most important, in almost *DIRECT PROPOSITION.* Thus, the parasite loading, l_p, can vary over a fairly wide range with little effect on sinking speed, while the span loading gives a good indication of sinking speed.

Now notice what effect changes in span loading have on the rate of climb. Notice this is very small, a 50% change in span loading increasing rate of climb only 4%

(from 501 to 522 ft. per. min.). This is demonstrated by keeping the weight constant at five pounds, increasing the span from 7 feet to 9 and 10 feet, increasing aspect ratio from six to ten and twelve-and-a-half. This means that power loading and parasite loading remain constant, while span loading alone changes.

The conclusion from these charts is immediately apparent: To increase rate of climb, decrease power loading, l_t, since span loading has practically no effect on rate of climb. To decrease sinking speed, decrease span loading. CHANGING WEIGHT AND SPAN ONLY HAVE PRACTICALLY NO EFFECT ON MAXIMUM SPEED! Notice that by decreasing the weight four pounds (8 oz. wing loading) and increasing span to ten feet, still keeping area constant, the maximum speed has been increased but 1.2 miles per hour! So the fellows who think that they can cut down speed by removing weight are all wrong, since the speed actually will increase very slightly. Actually, the parasite loading, l_p, is the main factor determining top speed. Therefore, speed may be decreased by increasing f, the parasite factor. This was shown (Fig. 1) to depend upon wing loading, but note that f is changed only by changes in area and not weight. Thus, changing wing loading by lopping off a pound or two has no effect upon f, while changes in area change f according to Fig. 1. Of course top speed is interesting only in a general way, and it is not necessary to spend too much time in determining it.

The L/D, it can be seen, is affected mainly by aspect ratio. This means that ships with high aspect ratios will have flat glides, though not necessarily low sinking speeds, since the glides may be fast. However, as stated before, span loading alone is the main determining factor.

Now notice how low the airspeed is at minimum sinking speed. The range is from 15.6 to 11.4 miles an hour, the latter figure for the Aristocrat with weight cut to four pounds and span increased to ten feet. Remembering that this model is highly streamlined and noticing that l_p has quite an effect on V_s, from Fig. 7, model builders are cautioned against providing an unclean model with high aspect ratios and low-wing loadings. If that is done the airspeed at minimum sinking speed may fall below 10 miles per hour. This is dangerous! For, at low speeds, the lift falls off and drag increases because of changes in the nature of the air flow. Therefore, the theory which has been used to develop this performance procedure is no longer valid and results will be inaccurate.

Finally, notice that the time of flight on a 20-second motor run is largely dependant upon the general loading factor, L, which, as mentioned before, is similar in nature to C. H. Grant's flight coefficient. The times, listed in the last horizontal column, are distinctly in accordance with this author's experience with this type of model.

The subject of adjustment will next be touched upon, followed by propeller selection, and finally general design.

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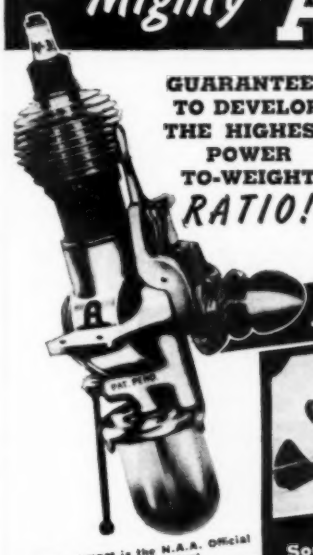

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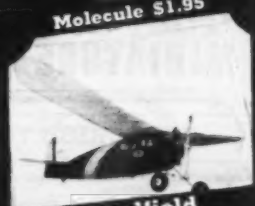

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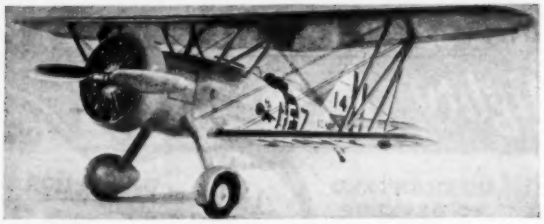

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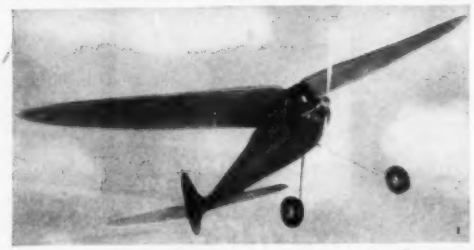

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Vanguard of Triumph

(Continued from page 17)

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And out on the Pacific Coast just outside Downey, a suburb of Los Angeles, California, lies the recently expanded factory buildings of a young company with big ideas, with comfortable resources and with the courage to give that "go ahead" signal: Vultee Aircraft, Incorporated; builders of our Plane on the Cover this month, the "Vanguard" fighter!

From the tip of its shiny nose spinner to its pointed tail cone it has been built for production and this quality has been sacrificed only when it meant hampering its fighting and flying characteristics. Like a page from the Detroit automobile production lines, Vultee's mighty Vanguard will roll down the line at a steady pace while its innards are stuffed and expanded with the million and one odds and ends that go to comprise the modern fighting ship.

Once again "Hidden Power" (See MODEL AIRPLANE NEWS, March, 1940, issue) has been used, for the Vanguard mounts a huge Pratt & Whitney Twin Wasp S3C4-G fourteen cylinder air-cooled radial engine beneath its long, sloping nose cowl. Developing 1100 horsepower at rated 2550 r.p.m., this giant motor is situated just forward of the firewall and drives the giant 11-1/2 foot three-bladed all-metal constant-speed Hamilton propeller through a huge gear box over three feet long. Cooling is accomplished through one screened air scoop located just under the nose which takes in air under a considerable ram and forces it through ducts to the tightly baffled engine cylinders. Due to the pressure differential between the front and rear sections of the power plant, this air is sucked rearwards, past the cylinders and out of the cooling gill just forward of the firewall.

Offered in three models to the export trade, the Vanguard 48A is powered by the giant 1600 horsepower Wright "14", the Vanguard 48C with a Pratt and Whitney Twin Wasp (as originally installed on the prototype shown on the cover) and the Vanguard 56A with a Twin Wasp installed in conventional long-chord radial cowl.

The engine mount is of chrome-molybdenum welded steel tubing of X-4130 grade steel purchased in the normalized state and heat treated to a tensile strength of 95,000 pounds per square inch. This is bolted to the engine mount attachment lugs at the firewall and supports the engine on nine welded steel fittings. The firewall is located 17 inches aft of the cooling flaps, giving room for the power plant installa-

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tions. The oil tank is of seam-welded formed dural sheet blocked on the hydraulic press and subsequently heat treated from 24SO to 24ST. It has a capacity of 21.8 quarts with ample foaming space provided. The oil outlet line leads direct to the engine crankcase. After it has circulated through the engine it is carried through a Cuno strainer and purifier aft to the oil temperature regulator or "oil cooler" mounted by brackets in the bottom of the fuselage beneath the pilot's cockpit. This cooler is equipped with a spring loaded thermal relief valve in which the oil when cold passes directly back into the tank instead of through the cooler. The cooler is tunnel fed with air controlled by shutters which is passed to the rear through a second tunnel. The cooled oil is carried forward up into the top of the power plant compart to the oil tank.

The fuel system consists of two tanks, one located within the central portion of the wing and the other within the fuselage just forward of the cockpit. The wing tank is equipped with a standpipe which provides for a 28 gallon reserve supply. The total fuel capacity is 240 gallons, which at a specific fuel consumption of .430 lbs./B.H.P./hr. gives the Vanguard 48C a cruising range of 580 miles. The fuel is routed directly from each tank to a selector valve and thence to the combination fuel unit located on the firewall. This unit combines the use of the fuel strainer, the hand fuel pump and the fuel pressure warning signal which flashes in the cockpit when the operating tank pressure falls below the 3-4 pounds necessary.

The firewall is of stainless steel sheet bolted to the fuselage by means of brackets. The fuselage front section is built up of welded chrome-molybdenum steel X-4130 purchased normalized and heat treated to 95,000 pounds per square inch. To this are attached the clips necessary to attach the front fuselage side panels, the front upper cowling panels and the cockpit fairing strips and windshield assembly. Four points of attachment are provided in the bottom of the structure, each consisting of two threaded bolt holes, to which the wing attachment fittings are bolted.

The pilot is located in the middle of the fuselage and is completely enclosed by a conventional sliding hatch and fixed windshield and aft glassed cowling. The windshield is made of a single piece of laminated plate glass moulded to the contour of the fuselage. It is attached to the 24ST Alclad frame by tubular rivets. The sliding and aft sections of the enclosure are made of moulded plastic acetate sheet of 1/4-inch thickness on the flat side panels and 1/8-inch thickness on the upper curved portions. Corner blocks are used to secure the panels to the frames and the entire assembly is riveted with tubular rivets. Emergency release handles are provided in the center frame braces on each side of the sliding section. In emergency, this handle is pulled down, releasing pins attaching the panels to the frame and allowing the former to be pushed free.

The seat is of spot-welded aluminum alloy construction and is equipped with con-

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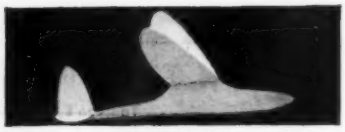

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ventional shock-chord vertical adjustment. The instrument panel is located high and forward within the cockpit and consists of a main panel and three sub-panels. The main panel equipment has been left to the discretion of the purchaser. The lower left panel contains the electrical controls including the ignition switch, the generator main line switch, the navigation light switches (if desired), the pilot heat switch, the cockpit illumination rheostat control by which the brilliance of the cockpit lighting may be adjusted to day or night conditions, the landing and signal lights, and the machine gun controls. The right sub-panel contains the starter energizing and engaging switches, the primer pump and the fuel signal light testing switch.

The main flight control panel is located on the left side of the cockpit and contains the flap control handle, the flap position indicator, the landing gear and tail wheel control handle and position indicator, the emergency hand fuel pump, the rudder, elevator and aileron trim tab controls and the gasoline and oil pressure gauges.

The aft section of the fuselage is of aluminum alloy semi-monocoque construction built up in the conventional former-stringer-sheet covering combination. The front and rear sections of the fuselage are bolted together at four points of attachment with two bolts at each poin. The horizontal and vertical stabilizers are of all-metal aluminum alloy construction and the former are not adjustable. The rudder and elevators are of all-metal fabric covered construction with the exception of the trim tabs which are of corrugated metal sheet design. These surfaces are aerodynamically and statically balanced through the use of lead weights riveted into the leading edge.

The tail cone section is readily detachable and houses the identification and navigation lights at its rearmost tip.

The wings are of single-spar construction which is composed of a single flanged channel section reinforced by a single sheet false web. The ribs are of pressed flange form and are built in two sections, the nose and tail portions being riveted to the spar to complete the rib form proper. Extruded longitudinal stringers are attached to the ribs by means of clips and the entire frame covered with 24ST Alclad sheet flush riveted throughout.

The ailerons are of all-metal aluminum alloy construction fabric covered and have combination trim and booster tabs. Total aileron area is 17 square feet.

The flaps are composed of two panels separated in the center by a width of fuselage. They are of all-metal aluminum alloy construction and are covered by sheet 24ST Alclad. They are operated by a single laterally actuated tube to which is attached turnbuckles at each flap rib.

Total wing area on the Vanguard is 196.7 square feet which gives it a span of 36 feet and a mean aerodynamic chord of 45.5 inches.

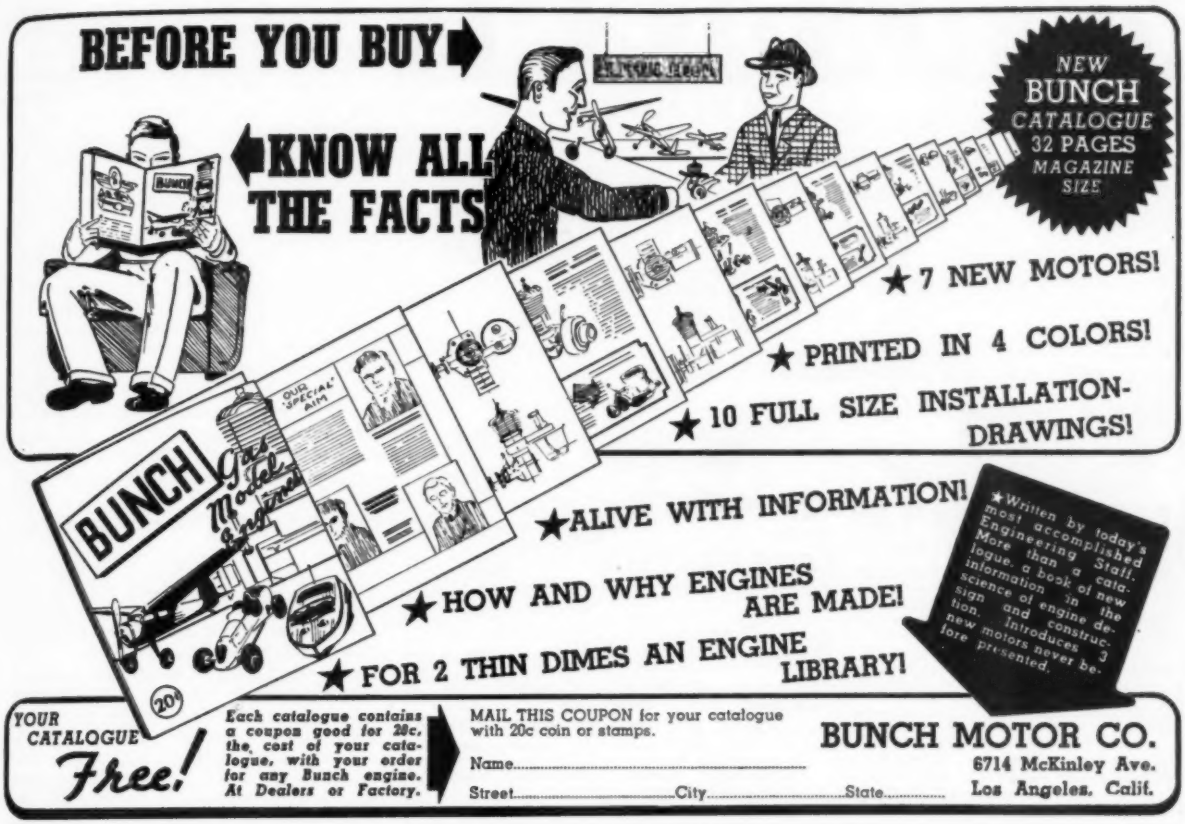
The landing gear of the Vanguard 48C is of identical design and dimension to that used on the original Hughes racer. Of complete cantilever construction it has a tread of 161 inches and a height of 4 feet 7 inches, making it unique among this class airplane. The two legs fold inward and up into the fuselage wheel wells by hydraulic action, the entire opening being sealed by retracting metal doors which fold outward. The tail wheel is also fully retractable, its opening being completely closed by folding clam shell doors. The two units are interconnected and are operated as one unit. The main hydraulic selector valve and fluid reservoir is located just aft of the pilot's seat and has a capacity of 2.4 gallons of castor-oil hydraulic fluid. The cockpit controls operate the landing gear and flaps independently of each other as landings and take-offs without flaps are usually made in the latter case, frequently in the former. Power is derived from the engine-driven hydraulic pump located just forward of the firewall and suitable relief, pressure and thermal expansion valves, the latter to take care of seasonal fluctuations in the density of the fluid, are provided in the hydraulic system.

Two methods of landing gear warnings are used, a position indicator as mentioned above operating in connection with a warning horn which sounds when the throttle is cut under one thousand feet and a peddle agitator which vibrates the left rudder peddle when an unsafe landing condition exists. Positively controlled up and down position latches secure the landing gear in place.

Empty weight of the Vanguard 48C is 4,657 pounds which, with its full military load of 1,372 pounds, gives it a gross weight fully loaded of 6,029 pounds.

It has an over-all length of 27 feet, 10 inches, a wing span of 36 feet and a total height of 13 feet 6 inches.

Total wing area including ailerons is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196.7 square feet, vertical tail surfaces 15.20 square feet and horizontal tail surfaces 48.95 square feet.

Armament aboard the Vanguard has been left to the discretion of the purchasing government but designs have been made available for the installation of two synchronized guns firing through the propeller, from two to eight guns mounted in the wing of the 30-50 caliber variety and any combination of the above two with two Colt or Madsen shell guns mounted in the wing outer panels. Preliminary wind tunnel tests have been conducted with two 30 caliber Browning machine-guns firing through the tail mirror-aimed, and tests rigged up in the mock-up stage for this installation but results did not warrant its installation on production models.

Performance figures following are specification guarantees and may be accepted as being as much as 10% below the actual figures for this type ship. High speed at 15,600 feet for the Vanguard 48C is 358 miles per hour. Cruising speed at 18,000 feet is given at 316 miles per hour. Service ceiling is 34,300 feet and absolute ceiling is 36,250 feet. The Vanguard lands at 72.9 miles per hour, making it no ship for the amateur to fly. Its rate of climb is past the 6,000 feet per minute mark, which makes the Vanguard capable of flying straight up at more than a mile-a-minute! At last, an American interceptor worthy of the name.

Recent expansion at the Vultee plant brings to a total of 300,000 square feet the total floor space available and $20,000 worth of new equipment will go into this space shortly. Why?

Well, here's the answer. As we sat in Dick Palmer's sumptious private office with the symbolic "V.P." on the door behind us we asked him: "You gambled nearly a million dollars on the Vanguard. Was it worth it?"

Handsome, black mustached, youthful Palmer twisted his close-lipped mouth in a wry smile and answered simply, "Yes, it was worth it."

And our eyes dropped to a paper he held in his hand, an order from the Swedish government for one hundred Vultee Vanguard 48Cs!

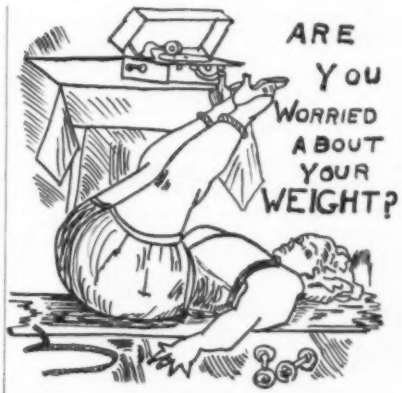
Wings Across the Atlantic

(Continued from page 7)

step producing less aerodynamic drag than the more common athwartship rear step and allowed the use of the water rudder, a necessary feature for the great flying boats.

Hydrostabilizers, sea-wings, were incorporated into this design plan to give the ship lateral stability on the water. They proved a definite advantage over the wing-tip floats. They were better for taxiing and maneuvering on the water at high speeds. They took turns easier. But greatest of their advantages was that they supplied an excellent place to store fuel—fuel for that long non-stop flight over water.

The rudder design caused considerable trouble. First it was a single rudder, then a double rudder and then, finally it was decided to use three rudders. A triple tail for Boeing Clippers after three trials. Reason was that this arrangement gave better stability to the ship when she was on the



To celebrate the opening of our new Fireproof, Ultra-modern factory we have reserved the announcement of this new development in Gas Model IGNITION COILS to be known as the COMPETITOR. This coil is of radically new design and sets a new standard in Ignition practise. The spark is hotter, the battery drain is less, and the weight has been reduced to ONE AND ONE-HALF OUNCE. Priced complete with high-tension lead $1.75.

BELIEVE IT OR NOT the weight is ONE AND ONE-HALF OUNCE

The COMPETITOR is a high quality coil such as you would expect from the world's leading maker of miniature ignition equipment.

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FAIRCHILD RANGER (RUBBER POWERED) **$1.50**

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See page 39

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water though this arrangement did not improve the looks of the ship. After all looks are secondary.

How to control this air giant was another problem for its designers, but this was solved by the use of the regular Boeing control tab system. Briefly this system, which is in use on the large army bombers, is this: Small "auxiliary" ailerons and elevators are a part of the larger control surfaces and these "seconds" are controlled directly by the pilot's hand mechanisms. They, in turn, through small spring transmissions connected with their respective parts (ailerons, elevators or rudders), react on these with the same action as the pilot applies, causing the desired movement of the respective units. The slightest touch of the controls is sufficient to maneuver the control surfaces which are in some instances as large as the wings of smaller ships.

Such was the problem of design; worked out by "pencil-pushers" with creative minds, the plans soon took shape. From the white lines on blueprints came small models and soon Boeing 314 was ready for construction.

The shipyards at Hampton Roads had little on this Boeing Company when once it started construction on these giant ships, for the methods approached ship-building technique. The hull was built inside the assembly building, in a giant jig similar to a cradle that forms the base for the hull of a ship. A maze of scaffolding and walkways allowed workmen to work at five different levels, simultaneously.

Constructed in a separate building were the wings. They required intricate jigs and construction frames to complete their framework. A million parts had to be fitted together just so to produce their camber and taper.

Then came the day when hull and wings were to become a single unit and the Clipper was moved outside the building on a movable "drydock"—a 15 ton steel cradle with flotation tanks to make it bouyant in the water and with eighty heavy wheels to roll down the ram during the process of launching.

Here was the biggest baby that Boeing had ever produced—the largest airplane in the world. It was a big day for everyone when she slipped gently into the waters of Lake Washington for the first time. And she was beautiful. . . . Graceful with lines that branded her a clipper; sturdy and complacent which branded her SAFE. But one thought was in the minds of those who saw her; one thought which could take away all of this and brand her a failure.

Would this "house with wings" fly? Could she fly?

On June 7, 1938, the world learned the answer.

The motors didn't fail. That new hull design cut the water as neatly as the fin of a fish. Her wings spread gloriously against the cloudless sky; a tribute to man's inventive genius.

She was a thing of beauty, but statistical data made her great. She weighed 82,500 pounds gross. She had two full decks, connected by a spiral staircase and eighteen separate rooms within the hull proper. She measured 109 feet long, 28½ feet in overall height, with a wing span of 152 feet. She could carry 74 passengers by day, 40 by night, in addition to a crew of eight. Cargo holds had a capacity of more than 10,000 pounds of mail and air express. And she could fly 4,000 miles with forty passengers aboard, at a top speed of 200 miles per hour.

That was fulfilling a contract!

If you are one of those travelers who intend taking this "Yankee Clipper" across the ocean for one of its regular week-end trips this summer, here is what you'll find inside the new air giant. You'll board the silvery ship by a gangplank that leads to the broad upper surface of one of the hydro-stabilizers. Entering the passenger deck by a side door, you step down three steps into the dining salon and recreation center, the largest room in the ship with the exception of the control room on the upper deck. Here is where you dine while flying high above the Atlantic waves on your way to Europe or "round the world by air." Modern style tables rest between casually arranged overstuffed chairs. Handsomely styled furniture is built with light but sturdy aluminum frames and is cushioned with a newly developed pillowy substance made of curled Australian horse hair impregnated with latex. Color schemes of the upholstery, wall and ceiling lining, deep carpets, trimming vary in different compartments. The

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12" wing spread. A lightweight model stressing flying performance. Adjustable wing and landing gear for obtaining proper weight and balance. Can be built ready to fly in about 1½ hours. This kit offers the beginner a splendid chance to complete and fly his first model.

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wide double windows in each compartment are fitted with modern Venetian blinds.

The surprise compartment for travelers, however, will be the bridal suite. It is attractively furnished with a triple seat built-in settee, dressing table or desk, two end tables, glass mirrors, wash stand and cabinet and an incidental overstuffed chair.

Also on the passenger deck, you enter another standard compartment, then a section containing a galley to the port and men's dressing room to the starboard. There is a drinking fountain at this end of the passenger deck and another at the stern.

The galley contains an ingeniously compact arrangement of equipment designed and built by Pan American Airways for serving full-course meals to their sizable list of transoceanic passengers. Not only are there the necessary cupboards, drawers, containers, etc., but an ice refrigerator and a steam table. Between meals a cocktail bar may be set up in the galley.

In the hallway between the galley and the men's dressing room there is an interphone with which the steward may call various officers on the flight deck above and a 56-station annunciator panel with signal lights for the steward, individually connected to each of the many call buttons throughout the ship. Nearby is a spiral staircase leading to the upper deck where the control room, cargo holds and crew's living quarters are located.

The Clipper's control room is a far cry from the old style cockpit. It is designed for a flight crew of six and has a volume of 1,078 cubic feet, or approximately five times as much room per individual crew member as the cockpit of a mail plane.

Were it not for the panels of instruments and technical devices and the absence of pictures on the walls, the room might well be mistaken for a parlor—all chairs and arm rest are deeply upholstered, the floor is covered with deep-piled carpet and walls have attractive lining over thick soundproofing and insulation.

This control deck is remarkable because of its extremely large proportions, but designers believed in giving the crew plenty of room. The main control room measures 21 feet long by 12½ feet wide. At the forward end are the pilot's and co-pilot's stations, with a surprisingly small number of controls and instruments because many of the functions performed by pilots on smaller airplanes are allocated to other members of the crew on this big ship. On the port side behind the first pilot is the navigator's station, with a broad table for laying out full-size nautical charts. Across from the navigator, on the starboard side, is the radio operator's desk, with complete radio equipment including radio direction finder. He has three transmitters and four receivers.

The rearmost station on the starboard side, across from the captain's desk, is the flight engineer's quarters, with desk and expansive instrument and control panels. The engineer handles fuel valves, mixture controls, temperature controls, propeller adjustment controls and engine synchronization. He has delicate instruments to keep all engines properly coordinated.

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- **DIRECT DRIVE** No loss of power through clutches—Increases speed—Flywheel balanced scientifically to increase inertia and eliminate stalling.
- **FRONT WHEEL DRIVE AND STEERING** Steering may be set so that the tractor wheels will follow the prescribed course without skidding.
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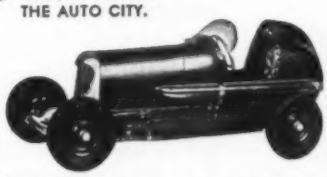
- **STEEL FRAME** Eliminates breakage from road shock and collision.
- **BUILT IN DETROIT** THE AUTO CITY.



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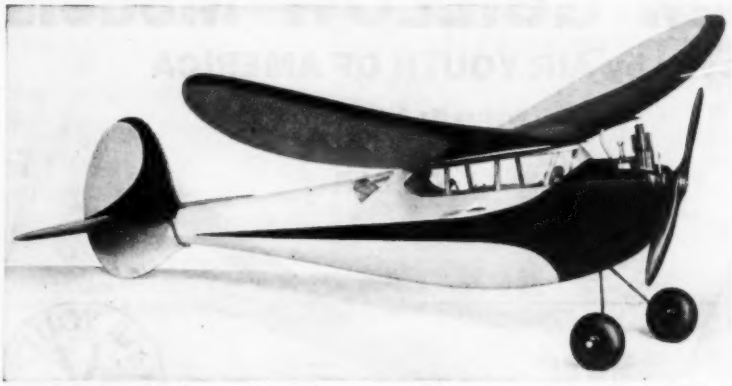

In the first 1940 Contest, held February 22 on Long Island, the Bay Ridge TOPPER, took first in Class A with a new NAA three-flight record of 1:50, powered by a new Bantam. Another TOPPER, powered by a RANGER, took fourth in Class B, both ships being flown by Gordon Murray, designer of the TOPPER. During development the TOPPER placed in twelve consecutive contests, with no place lower than fifth, except for a sixth at the 1939 Nationals.

Absolutely the nearest thing to a self-building kit on the market. Pre-fabricated units include ready cut outline for Sky-Scraper wing, all wood and balsa parts pre-cut, ready formed landing gear. Kit comes complete with plenty of cement and dope, M.&M. airwheels, bamboo paper for wing, silk for fuselage. Get yours today at this special price..... $4.95 P. P.

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BAM-BOO TISSUE

Aft of this main control room are the cargo sections in the center of the giant wings, divided into separate compartments for mail, baggage and express. Above the center aisle in this section is a large cargo loading hatch, fitted with a glass-enclosed turret for celestial navigation. Out beyond the cargo sections in each wing is a 600 gallon fuel tank. Main gas reservoirs are in the hydrostabilizers below.

Once you have completed this inspection of the great ship you can settle down in the davenport-type armed lounging seats, and prepare for the flight ahead.

Europe is only 24 hours away.

American wings have conquered the Atlantic. The Pacific is a thing already tamed by the mighty wings of the Clipper Ships of the air. Great silvery wings—wings that span over land and sea. Let us hope they will eventually link all nations in a bond of everlasting friendship.

The Indoor Pioneer

(Continued from page 17)

Propeller

A very important feature on any model is its propeller. For those who intend to fly the PIONEER in a parlor, a bent prop will suffice. If a large auditorium is to be had much better results will be had if a carved prop is used.

The prop is cut from 1/64" "A" stock sheet. Sand off the fuzz and sand the tips to paper thickness. A camber of 1/8" should be bent into the prop, which camber may be kept in by applying a drop of microfilm and spreading it over each blade.

The prop shaft is bent from No. .012 wire, as illustrated on the plan. The prop washer may be of dural or of celluloid.

Covering

At this point all parts should be completed except for the covering and assembly. It is advisable to cover with microfilm, but if the novice is shy to attempt this, the heavier framework with superfine tissue may be substituted.

After the film is applied the dihedral angles may be cracked in. To remove the wrinkles pass a hot iron several inches under the surface and repeat till they disappear.

Now the PIONEER is ready for assembly and flight tests.

Flying

If the model is microfilm-covered power with 1/32" rubber; if it is tissue-covered, 3/64" will give sufficient power.

Wind up the PIONEER for 100 turns and let her fly. It should make tight circles about seven feet in diameter. If diving tendencies are noticed raise the boom slightly. If excessive stalls and dives are noticed move the wing struts forward or backward.

Having your PIONEER flying will be an unusual thrill. Many hairbreath flights can be made in your parlor; for endurance flights a large assembly hall will be sufficient. In a 20-foot ceiling the PIONEER turned in a 3 minute, 23 second flight.

It is recommended that if a contest version is desired a 30-square inch wing of elliptical shape should be employed. Here she is—let's go!

Air Ways

(Continued from page 27)

of 51 Morningside Avenue, Yonkers, New York in his aeronautical study and workshop. He derives great satisfaction from his hobby of model airplane building and flying, though he tells us he is a deaf mute. Mr. Soltis deserves great credit for the fine work he has done, examples of which will be shown in future issues. He is interested in exchanging ideas with other model builders and would appreciate it if they would write to him.

At the present time one of the greatest needs in the model field is qualified instructors. It has been extremely difficult for older men with responsibilities to keep abreast of the advance in the art of model work and keep pace with the ability shown by young men in their teens. However, now a number of schools are giving special instruction which will qualify older men as teachers. In Chicago special classes are held for them and picture No. 8 shows instructors in one of these classes of a 7-weeks course carried on by the Chicago Parks District. Mr. Frank Nekimken is in charge of this work and he is instructor for the group.

We hope that the educational departments of other cities and towns will follow the example of Chicago and provide efficient instructors for this type of work. In tests made in many localities throughout the country it has been definitely proved that delinquency among juniors may be decreased 50% or more by encouraging young men to take up model designing, building and flying.

Originality Contest

We are holding another Originality Contest. Pictures of the winning airplane submitted by readers will appear each month. All that is required is that you send clear

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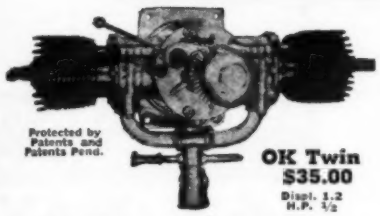
Handicapped?

The "O.K." 49 was designed to fill the gap under the new rules. Will fly a 40 ounce ship with performance formerly attained with .600 displacement motors only.

A motor for the thousands of ships in existence handicapped by the new rules—a real motor for new type ships on the market now.

COMPLETE $12.50 with COIL CONDENSER & EXHAUST STACK

SPECIFICATIONS	
Displacement	.493
Horsepower	1/5
R.P.M.	500-12,000
Flying weight—coil, condenser	11½ oz.
Translucent gas tank	Balanced cooling



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OK Twin $35.00

Displ. 1.2 H.P. ½

The "O.K." Twin is a C class motor and can be used for contest work by those desiring to fly big ships.

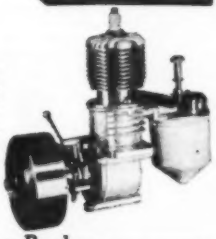
"O.K." AIRCRAFT MOTORS

Model	Displacement	Price
49	.493	$12.50
Special	.604	12.50
Standard	.604	16.50
DeLuxe	.616	19.50
Twin	1.208	35.00

Raceway & Marine

49	$15.00
Special	15.00
Standard	18.00
DeLuxe	21.00

The new 49 motor comes under the newly created B class for miniature car racing.



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"O. K." Engines—start easily, run consistently!

pictures of the plane you wish to enter in the contest. They will be judged on the basis of originality of design and construction and the adaptability to the purpose for which it has been built. An award of $5 will be given each month to the builder submitting the winning pictures.

This month Arthur Bujnowski of 36-52 35 Street, Astoria, New York, wins the prize. His machine is shown in pictures No. 9 and No. 10. This is a twin-motored autogiro boasting a three-wheel landing gear. This ship has many unusual features about it which should make it extremely practical and useful. First of all, it has twin motors, propellers of which turn in opposite directions. This balances the torque which is usually created by one motor. Correct steadiness and stability is obtained in flying because of this. The ship should be unusually efficient because of its careful streamlining and boom tail arrangement.

The whole set-up lends itself to efficiency, not only aerodynamically but in respect to its use as a fighter. You will note that there is an opening at the rear of the fuselage through which a machine gun protrudes. We note that Bujnowski is following the trend in modern design by using tail booms. He is to be complimented on the originality shown.

Mr. DeWayne Johnson of 3538 S. Benton, Kansas City, Mo. has sent us a sketch showing the layout of a puller-pusher boom-tail ship which he has built. It is extremely interesting in design and one which a number of model builders of experimental inclination may wish to try. The plan is shown at the bottom of page 27.

Model News from Other Countries

England

George Whitfield of Earsdon Grange, Earsdon, Northumberland, England, sends us some news from his "corner of the globe." Though to some extent activity in the model airplane field has been affected by world conditions, the Newcastle Model Aero Club, of which he is a member, is going ahead as best it can. He tells us he recently finished the construction of a "Flying Midget Gas Model" from plans in the August, 1937 issue of MODEL AIRPLANE NEWS. It is his third gas job and he says he built it because of its small size and super-climb, since he has "to go easy" with gasoline. At present Whitfield and a number of club members are building scale models for use by army for instruction purposes.

Denmark

The Dansk Modelflyver Forbund of Mariendalsvej 56, Kobenhavn F., Copenhagen, Denmark, a group of Danish air modelers, has organized an International Model Airplane Show to be held in Copenhagen in May of this year. Quite a number of American exhibits are expected to be incorporated in this show; as well as models from England, Germany, Sweden, Denmark, Italy, Holland, Belgium, France, Spain and Norway. The Show will include sailplanes, rubber powered, scale, indoor and gas models; magazines, catalogs and other literature. Anyone who is interested

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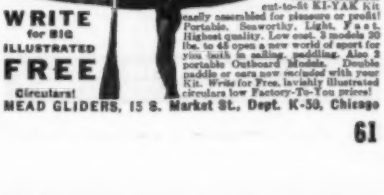
BIG MONEY Assembling **NEW MEAD KI-YAK** at Home!



MEAD'S complete cut-to-fit KI-YAK Kit easily assembled for pleasure or profit! Portable. Seaworthy. Light. Fast. Highest quality. Low cost. 3 models 20 lbs. to 45 open a new world of sport for you both in sailing, paddling. Also 2 portables Outboard Models. Double paddle or oars now included with your Kit. Write for Free, lavishly illustrated circulars low Factory-To-You prices!

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SELLEY ACCESSORIES

BOMBS and TORPEDOES

13/16" 2 for 5c
1¼" 5c

DEMOLITION BOMBS
15/16" 3 for 5c
1⅛" 3c

FRAGMENTATION BOMB
1⅛" 5c

TORPEDO
3" 15c

DUMMY MOTORS
1" 9 Cylinder 15c
1½" 9 cylinder 25c

Cellu-loid	Motor Plate
1½"	9c 5c
2"	12c 5c
2½"	14c .....
3"	17c 5c

LEWIS GUNS
¾" ..... 2 for 5c
1¼" 3c
1⅝" 5c
2" 8c

Browning Guns
¾" ..... 2 for 5c
1¼" 3c
1¾" 8c

PURSUIT GUNS
¾" ..... 2 for 5c
1" 3c
1½" 5c

Dummy Ratchet Gun
⅞" long 5c

MARLIN GUNS
1½" 5c
2" 10c

SPANDAU GUN
1½" 5c

VICKERS GUN
1⅜" 5c

Ring Mount Guns
1¼" Type B 20c
1⅝" Type A 25c

Anti Aircraft Gun
2" 25c

Swivel Type C
2" d'ble action 8c

Alum. Disc Rubber Tired Wheels

½" dia.	5c ea.
⅝" dia.	6c ea.
¾" dia.	7c ea.
⅞" dia.	7½c ea.
1" dia.	8c ea.
1⅛" dia.	9c ea.
1¼" dia.	10c ea.

WHEELS

SEND 5c FOR CATALOG

Aluminum Disc Bal. Tired Wheels

1½" dia.	15c
1¾" dia.	18c
2" dia.	20c

Celluloid Balsa Wheels Wheels

¾"	5c pr. 4c pr.
1"	7c pr. 5c pr.
1⅛"	10c pr. 7c pr.
1⅜"	14c pr. 10c pr.
2"	30c pr. 13c pr.

Treaded Tire Alum. Disc Wheels

1 3/16" dia.	30c pr.
1½" dia.	40c pr.
2" dia.	50c pr.

Do-Nut Air Wheels Sponge Rubber Tire

1" dia	10c pr.
1¼" dia.	14c pr.
1½" dia.	18c pr.
1⅞" dia.	20c pr.
2½" dia.	50c pr.

AXLES—Threaded & fitted with washers, bushings and nuts.

Lgth 1/16", 3/32", ⅛"
2"-3"-4"-5"-6" .12.10.20
7"-8"-9" 14.12.23
10"-11"-12" 18.15.25

Axle Fork & Swivel
⅛" to ⅝" wheel 10c
¾" to ⅞" wheel 15c

PROPELLERS

DIE CAST

Standard 2 bladed		Standard 3 bladed		Hawk Type 2 bladed		Hawk Type 3 bladed	
1⅛"	5c	1½"	8c	3½"	18c	4"	25c
2"	7c	2"	10c	4"	22c	4½"	35c
2½"	8c	2½"	15c	4½"	22c	5"	35c
3½"	10c	4"	20c	5"	25c	5⅝"	35c
4"	12c	4½"	25c	5⅝"	30c	6½"	50c
4½"	15c	5"	30c	6¾"	35c	7"	55c
5"	22c	6"	40c	8"	45c	8"	60c
5½"	24c	7"	45c	9"	50c	9"	65c
6"	25c	8"	50c	10"	55c	10"	70c
6½"	30c	9"	55c	11"	60c	11"	75c
6¾"	35c	10"	60c	12"	65c	12"	80c
8"	40c	12"	70c	Props can be had up to 6" dia., Sandcastings in the rough Drilling shaft hole 15c extra. Postage 3c up to 6" dia., larger sizes 6c.			
9"	45c						
10"	50c						
12"	60c						

Spun Aluminum COWLS

Dia	Drag Ring	Open Face	Closed Face
1"	10c	13c	13c
1½"	10c	13c	13c
2"	13c	15c	15c
2½"	18c	20c	20c
3"	20c	25c	25c

Postage 6c

2¼"x4½"
Authentic Airplanes
24 ARMY ..... 25c Set
18 NAVY ..... 25c Set
16 WARTIME .. 25c Set

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Allied and American in colors. 3 sizes, 50 assorted, all on 1 sheet 10c

IMPORTANT—Minimum order, 50c. Add postage on all items but if over 15c on less than $1.50 order add only 13c. Orders over $1.50 add 10%; west of Denver 15%.

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H. & F. MODEL AIRPLANE CO.
273 VAN SINDEREN AVE. BROOKLYN, N. Y.

in displaying any material should write to the secretary, V. O. Anderson at Aalekistevej 108 B., Vanlose, Copenhagen, Denmark.

CLUB NEWS

Pittsburgh

Harry G. Vogler, Jr., Recreation Leader, W.P.A., Pittsburgh, Pa., sends us the following report of activities of his group:

"In keeping with the demand for more and better qualified leaders in model aviation practices and techniques, as well as building of models, the recreation-Education Division, of the Works Projects Administration, Allegheny County, with headquarters in Pittsburgh, has started a group of leaders in training for this work. The classes are under the leadership of Harry G. Vogler Jr., of the Boys Club of Pittsburgh, and are held at the Boys Club of Pittsburgh, with a thorough program of shop practices, nomenclature, theory of flight, contest procedure as well as the actual instruction in the building of model aircraft. Said leaders will soon be able to take back to their respective centers an opportunity that has been desired for a long time."

Following is a schedule of meets planned in the Allegheny Mountain Area at the Pittsburgh-Butler Airport:

March 31st: Glider H.L. Class B, Stick H.L. Class C, Fuselage R.O.G. Class D, Gas Powered Open, Novice event in rubber and glider, advance event in all sections. April 28: Glider tow-launched, Stick H.L., Gas Powered Endurance, Gas Powered Novelty. May 19: Free-for-all in Gas Powered Endurance Open. June 16: Glider H.L., Stick H.L., Fuselage R.O.G., Gas Powered. July 28: Glider Tow-Launched, Stick H.L., Fuselage R.O.G., Gas Powered Open. August 18: Free-for-all in Gas Powered Open. September 15: Glider H.L., Stick H.L., Fuselage R.O.G., Gas Powered Endurance. October 6: Championships in Glider H.L., Stick H.L., Fuselage R.O.G., Gas Powered R.O.G.

Further information on any or all of these meets may be obtained by anyone who sends a self-addressed, stamped envelope to Harry G. Vogler Jr., 1633 Duffield Street, Pittsburgh 6, Pa.

Linden

The publicity committee of the Linden Model Aircraft Club, Old City Hall, Linden, New Jersey, sends us the following news release:

The Linden Model Aircraft Club has received the N.A.A. sanction to again sponsor the New Jersey State Outdoor Model Airplane Championship Meet.

This meet will be held on May 30 with a rain date of Sunday, June 2. All events will be run off between 10 a.m. and 5 p.m. at So. Stiles St., in Linden, New Jersey. For the convenience of out-of-towners, this field is directly off the State Highway No. 25.

There will be an entry fee of 25c for Seniors and 15c for Juniors. Entry blanks for this meet can be obtained from the Linden Model Aircraft Club, Old City Hall, Linden, New Jersey.

Easthampton

Walter Niemies of 63 Parsons Street, Easthampton, Mass., writes that the group of which he is a member, the Thermal

The Lightest Coil Made

Aero

featherweight

Aero engineers have succeeded in inventing the lightest coil made. Weighs only 1⅛ oz. Specially made for two batteries (3 volt).

• FEATURES •

Lightest coil made: The aero featherweight weighs only 1⅛ ounces, and is therefore ideal for all class A ships. It can operate on pen cells.

STEP UP ENGINE SPEED: All aero Spark coils will furnish ignition sparks steadily up to speeds of 18,000 R.P.M.

SAVE ON BATTERIES: With these spark coils you can actually fly on the batteries that other builders throw away. Try it.

ALL COILS FACTORY TESTED: Each one is individually tested for spark-length, spark-heat, and ability to fire carbonized plugs.

Aero-Spark coils are high quality ignition coils . . . designed by ignition engineers and precision built with extreme care.

$2.25

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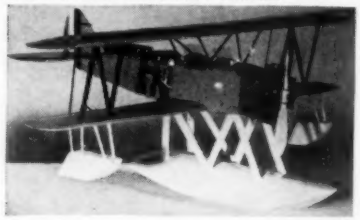
JACKSON HEIGHTS, L. I., N. Y.

G & L NAVY Seaplane Trainer

CUT-TO-SHAPE—Fuselage—Crankcase—Pontoon both Wings. 2 colors dope. Alum. prop. ALL INSIGNIAS. Full size detailed plans. This **SUPER DETAILED SCALE MODEL** kit of the **FAMOUS NY-2 NAVY TRAINER.**



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Complete line of 10c Solid Scales Models of famous Army, Navy, and Racing planes with PRINTED FUSELAGE BLOCK—up to 9" wing spans.

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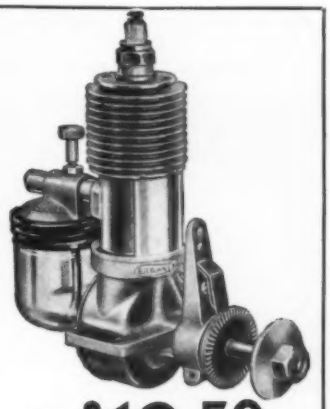
Sr. Dart (Kit)	50c
Jr. Dart (Kit)	35c

15c Extra Packing and Postage

The Choice of Champions— BROWN MODEL D



More value for your money! Precision-made in the world's largest and most completely-equipped plant devoted to the manufacture of miniature gas motors. The 1940 Model D includes the sound engineering advances used in other Brown Junior Motors. New and improved timer! New chrome molybdenum crankshaft, hardened and ground! New micrometer needle-valve! New *transparent* gas tank! Motor shipped ready to run, complete with coil and condenser.

PRODUCT OF JUNIOR MOTORS CORPORATION

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JUNIOR MOTORS CORP., 2549 N. BROAD ST., PHILA., PA.
I want to know more about the new Brown Model D motor.

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Price $12.50

All motors include spark plug, coil, and condenser. Factory block-tested and fully guaranteed. Bore, 7/8". Stroke, 1". Weight (bare), 6½ oz.

Riders, is "joining the fold" of the Air Ways Club. A number of the records of this club are interesting, and are:

Speed, 50 miles per hour; Wakefield, 30 minutes; Sport, 12 minutes; Sport R.O.G., 4:30 minutes; Contest Stick, 1:30 minutes. All these records are held by Walter Niemies except the Sport R.O.G., which belongs to Chet Kozick.

Galt

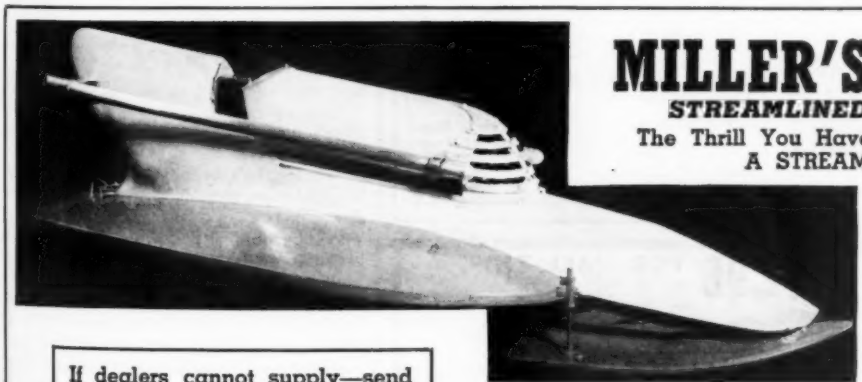
The Galt Model Aircrafters of Galt, Ontario, Canada, publish a small pamphlet called "The Aircrafter." The club is one of the oldest in Canada and their pamphlet presents a considerable amount of interesting material. Mr. John T. Dilly of 34 Aberdeen Road North, Galt, an old friend to most model builders, is the editor. We wish to congratulate this group on their enterprise.

Book List

Following is a list of books which may be of interest to our readers. They deal with various subjects in the field of aeronautics and should serve as a medium for a complete aeronautical education:

"Model Airplanes Building and Flying" by Joseph S. Ott, published by The Goodheart-Willcox Company, Inc., Chicago, Illinois; "Building and Flying Model Aircraft," Paul Edward Garber, Ronald Press Company, New York City; "Practical Aeronautical Engineering," Willis L. Nye, Aviation Press, San Francisco, Cal.; "Aviation Service and Maintenance," James G. Thompson, Aviation Press; "Getting a Job in Aviation," Carl Norcross, McGraw-Hill Publishing Co., New York City; "Aeronautical Occupations for Boys," Capt. Burr Leyson, E. P. Dutton & Co., New York City; "Simplified Aerodynamics," Alexander Klemin, Goodheart-Willcox; "Aeronautics In Theory & Experiment," Cowley & Levy; "Practical Aviation," Charles B. Hayward; "Handbook of Modern Aeronautics," Arthur W. Judge, D. Appleton & Co., New York City; "Airplane Structural Design," Jones & Frier, Sir Isaac Pitman & Sons, London, England; "Airplane Construction & Operation," John B. Rathbun; "Metal Airplane Structures," Major Flavius Loudy, Norman W. Henley Pub. Co., New York City; "Airplane Servicing Manual," Victor W. Page; "Metal Aircraft" (Design & Construction), Willis L. Nye, Aviation Press; "Handbook of Aeronautical Vocations," Walter Van Haitsma, Zeeland Record Co., Zeeland, Michigan.

The books by Willis L. Nye should be extremely helpful. They are up-to-date and present the material in a simple and understandable manner. Those who want a "job" in aeronautics can obtain a great deal of helpful information from the books of Messrs. Carl Norcross and Walter van Haitsma.



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The Thrill You Have Been Waiting For—
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This model has adjustable steps, which make for better balance, speed and stability. Beautifully designed with dual exhaust pipes, aluminum cowling, wave fin, strut, rudder, complete driving unit, ground stainless steel shaft, special high speed propeller, universal joints, glue, two colors paint, selected balsa wood and mahogany. Full size plans, that any model builder can follow, including progressive construction photos.

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Gas Lines

(Continued from page 29)

5507 Boyer St., Philadelphia, Pa., writes:

"Last year the Quaker City Gas Model Association lost many of its ace flyers and designers to colleges and flying schools. Bob Lichten, nationally known figure and many times of local meets and Charles Bossi, whose father, Eana Bossi, is the famous aeronautical designer, are now taking Aeronautical Engineering at M. I. T. Bob Jacobson, holder of many records, along with Bob Scarsdale and Ed Miller, is now attending Rising Sun School of Aeronautics. Harry Appoion is now employed at Kellet Autogiro Company and is taking the Penn State Extension course in Aeronautical Engineering at evening school in this city. Also taking this course are Walt Eggert, Jack Conine and Emil Holtzhauser.

"In order to try and fill these vacated positions, Quaker City is trying to spread general interest over the city by organizing new units throughout the various parts of the city and suburbs and also by an extensive publicity campaign.

"The West Philadelphia unit now has thirty members and nineteen on a waiting list. Another up-and-coming unit, organized by Bill Beck of pick-a-back fame, is located in Roxborough. Bill is personally giving instruction to the younger members of the unit so as to start them off on the right foot."

Lansing

Birt Darling of the Michigan Model Aircraft Council, Lansing, says:

"So gasoleers north of the Mason-Dixie line spend the winter months tinkering on motors and new models, do they? Well, the Michigan Model Aircraft Council, instituted in Lansing on Jan. 28 to coordinate small craft activity in that state and to work in conjunction with Air Youth of America and the N.A.A., is out to disprove that theory!

"They seem to have done pretty well, too. Since the state council's major project will be to promote experimentation, two of its affiliated clubs, the Lansing Sky Club and the Holt Radio Flashes, lost no time. On the day following organization of the Council they sallied out to nearby Lake Lansing and there on the drift-covered ice conducted one of the first—if not *the* first winter meet to be held in these parts. No stupendous or world-shaking records were set and there were about the usual number of stack-ups, but the citizenry turned out nearly 1,000 strong to show its interest, thanks to plenty of publicity in the local press.

"The gasoleers were enthused to the extent that they've been flying off the ice every Sunday since the meet, which was unofficial and not sanctioned by the N.A.A. but more in the nature of an experiment.

"No, the ice-bound Michigan lads aren't hibernating in their cellars, thank you—they're getting ready for the summer and the big state-wide meet to be held in Lansing early in June."

San Diego

Dan Halacy, Jr., cor. sec'y, of the San Diego Aeroneers, 4144 48th Street, writes:

The regular Aeroneers contest was held Nov. 26, making 14 monthly contests the club has held. The new N.A.A. weight rule was used. About twenty-five modelers entered, including Elbert Weathers who came down from L.A. The winner was Don Jones with a three-flight total of 8:35. Harold Strawn placed second just a few seconds behind the winner. Bob Hogan's original design took third with a time of 6:30. Shelby Brown won fourth place.

As usual a crack-up prize was given. Al Johnson was the unlucky winner. His beautiful blue ship spun in under full power, demolishing the fuselage and seriously damaging the motor.

Amarillo

An interesting report comes to us from Amarillo, Texas.

Out near the edge of Amarillo, a trim red and yellow Cavalier, powered by a one-fifth horsepower gasoline motor, took to the air recently. Gliding smoothly along the soft surface of the fresh powdery snow, the tiny craft rapidly picked up momentum and then soared into the air, with not a jolt to indicate when it left the ground.

Two 18-inch skiis, replacing the conventional wheels, did the trick—and Frank Davis, Amarillo model airplane enthusiast, had one more stunt in his bag of surprises.

"She takes off with ease in 20 feet," Frank exulted as he reviewed the maiden voyage. "With the skiis on there in place of wheels she's better balanced and climbs and flies more steadily. And when she comes down, there's not a bobble. She slides along smoothly, gradually slowing down, the tail assembly settles, and she comes to a stop within 20 feet.

Originally, the ship was a little too large for the fifth-horsepower motor. With a wing-spread of six feet and a fuselage-length of four feet, the plane was somewhat cumbersome. Frank's homemade skiis, 18 inches long, set 12 inches apart and eight inches below the fuselage relieved the motor of much of the strain usually necessary to take the craft off the ground.

New Orleans

W. J. Norman, N.A.A. Contest Director of the Crescent City Gas Model Club, 4506

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Our 8th year catering to the hobby craft department
Model Planes, Railroads, Boats, Midget Racers, Wood Burning, Beadwork, etc., etc.
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VMS GAMMA
The Gamma performs equally well in Class A or B. Kit contains finished prop, air wheels, colored dopes, cement—Everything needed to build a complete plane—span of 45", easily constructed fuselage of strut and longeron type, shock absorbent landing gear with Trexler Air Wheels.

Air Wheels
VMS Prop
Colored Dopes

DEALERS WRITE

Hi-Speed motor $12.75 or only $10.75 and your old motor. Ohlsson "23"—only $16.50 or $14.00 and your old motor.

VILLAGE MODEL SHOP
213-12 Jamaica Ave., Queens Village, N. Y.

Freret St., New Orleans, writes:

"The Second Annual Aviation Industry Exhibit held in conjunction with the N.A.A. National Convention, January 10-14 in New Orleans, closed as a great success.

"Leading aviation manufacture from all over the nation entered interesting exhibits of all the latest in commercial aviation.

"The Crescent City Gas Model Club displayed some very interesting models. One model, attractive in spite of its battle-scarred condition, was a Fairchild Amphibian constructed by Gene Schwartz. Gene has had 12 ROW and 16 ROG flights to date. Very much detail was put in the model, including landing lights and retractable wheels and floats. Mr. Henry Heyman presented a model of his own design that was the last word in workmanship. His model was equipped with anti-stall slots in each wing. Pilots at the airport were somewhat skeptical about the model until Mr. Heyman obliged them with some very interesting flights."

Milwaukee

The Milwaukee Gas Model Chapter held a meeting January 22 at which the following officers were elected:

President, Howard W. Carlson; Vice-President, Charles F. Higgins; Treasurer, Gordon Wisniewski; Secretary, Edward Tschernoscha.

Mr. Carlson advised of plans being formulated by the state Exchange Clubs of Wisconsin to hold eliminations contests in their respective districts, the winners of which are to be sent, expenses paid, to a championship contest at Milwaukee on June 9. The winner of the June 9 contest will receive an expense-paid trip to the Nationals at Chicago. Only Wisconsin entrants will be eligible for the trip-prize; however ,all members of the N.A.A. are invited to attend the meet, which will be sanctioned by the N.A.A. Further details may be obtained from Mr. Tschernoscha at 2451 N. 25 St., Milwaukee.

Denver

We hear from William Yaich, who tells us that a new club has been formed. He says:

"We take great pleasure in announcing the formation of a new model club known as The Denver Gas Model Club, with temporary headquarters at 708 E. 17th Ave., Denver, Colorado. We have fifteen charter members and from all indications our membership will double within the next month.

St. Louis

We have some interesting information from "Pop" Parks. He comments as follows:

"On the first of May, 1939, I made a deal with the owner of a 112-acre tract of land which is free and clear of all obstructions, and is located within a twenty-minute drive by auto from the center of St. Louis, and is also served by the Spanish Lake Bus line for a ten-cent fare direct to the field entrance.

"Up until the time that this deal was made for the field, the model builders here in St. Louis Metropolitan District did not have a suitable model airplane flying field available and were in a 'mess' when it came

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(A251) Vickers-Armstrong Wellington Bomber; twin motor.
(A252) Vickers Supermarine Spitfire Pursuit; single motor.

• FRENCH •

(A253) Curtiss Hawk 75-A Pursuit (U. S.); single motor.
(A254) Morane 406 Pursuit; single motor.

• GERMAN •

(A255) Messerschmidt 110 Intercepter Pursuit; twin motor.
(A256) Heinkel 111-K Bomber; twin motor.

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If your dealer cannot supply you, order direct from us. Send 25c in coin for each plane ordered, plus 10c postage on orders under $1.00. Give order number and name of ship.

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"G" LINE FLYING

Sensational - New - Thrilling

GAS POWERED SUPER SPEED PLANES FLOWN UNDER FULL CONTROL

NOT RADIO CONTROLLED

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SPEED DEMON

DELUXE

$4.95 KIT COMPLETE

The Super Streamlined TIGER SHARK, "G" Line Speed Plane, roars through the air at the unbelievable speed of from 50 to 75 M.P.H. Due to the inherent "G" Line Flying Stability, engineered into this design, the Shark is unusually stable and easy to control. May be powered with any 1/7 or 1/5 H.P. Motor.

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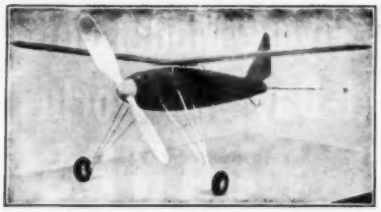
STREAMLINED—DYNAMITE

Douglas-Designed "UNIVERSAL SPEEDSTER"



Span 30". Length 25". Wt. 2 oz. This new Douglas-Designed speed model has absolutely EVERYTHING you need. ALTITUDE—SPEED—ENDURANCE, perfect GLIDE and M & M Model Wheels for smooth landings.

Complete Kit with M & M Model Wheels only $1.50 P.P.
"Aero-Glide" Kit complete $2.25 Postpaid
Douglas-Designed Aerobat with Automatic Folding Prop. Span 20". Length 19". Kit complete $1.25. Send for Free "40" Catalog, including special Gas Model Balsa.

Send Money Orders or **CASH** only. When sending cash fasten coins to letter with adhesive tape. If located in Washington add State Tax.

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to the flying of their models, this being especially true when it came to flying gas models.

"This field of 112 acres has been and is now operating under the name of Northdale Model Airplane Flying Field and is used exclusively for the flying of model airplanes and is available for use as such every day in the year. Since the dedication of this field there has been thousands of flights made, not only in meets and contests but also by any number of individuals and has been the means of creating a lot of interest in gas model building and flying.

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Full information about the field can be had by calling on or writing to 'Pop' Parks who is Northdale Field Director, at 3607 N. Grand Blvd."

Contest Schedule

The Queen City Gas Model Club, 1800 Myrtle Avenue, Plainfield, N.J., will hold a contest at Hadley Field on May 18. Events are Class A alone and combination of Class B and C, making two events. Prizes will be motors, trophies, etc.

The annual meet of the East Paterson Gas Model Club, Inc., 129 Linden Street, E. Paterson, N.J., will be held at Cherry Hill, E. Paterson, on May 12. May 19 and May 26 are rain dates. It is N.A.A. sanctioned. Entry fee for each class is 25c. Send applications to George Moro, 78 Plauderville Ave., Garfield, N.J. Fees will be paid at the field.

The Anderson Gas Model Club of Anderson, Indiana, will sponsor a gas model open contest on Sunday, June 23. Entries must conform to new N.A.A. rules though contest is not N.A.A. sanctioned. Entry fee is $1 in advance with 50c refund at the field. Mail applications to Harold Tremps, R.R. No. 7, Anderson, Ind.

The Mad Modeler Club of Ft. Wayne, Indiana, will hold its second annual gas model contest at Municipal Airport, Ft. Wayne on June 2. Contest is open to everyone and will be run under new N.A.A. rules. Further data may be obtained from Walter A. Krull, 414 E. Washington St., Ft. Wayne.

The Madison Gas Model Club will hold an N.A.A. sanctioned meet on June 16 at the Royal Airport, 3 miles south of the city of Madison, Wisconsin. All N.A.A. members are invited to compete. Entry fee is 50c. There will be prizes of trophies, motors, kits, etc., and a free lunch will be served to all contestants. Further data may be obtained from Marvin Schumacher of 2042 E. Dayton St., Madison.

The New England States Open Gas Model Championships of 1940 will take place on May 19 (rain date, May 26) under official N.A.A. rules and sanction. Data may be obtained from Leonard I. Day, 119½ North St., Salem, Mass. Entry fee is $1 per contestant. There is a state rule requiring 10-oz. wing loading, which will be enforced.

The Southwest Gas Model Associations recent convention, held at the Breakers Hotel, Corpus Christi, Texas, set the following dates for contests in this vicinity:

College Station, May 12; Graham, May 26; Oklahoma City, June 9; San Antonio, June 23; Houston, July 21; Dallas, August 4; Fort Worth, August 18 and Corpus Christi, September 1.

The Quaker City Gas Model Airplane Assn. holds its fourth annual invitation meet on September 7 at the Northeast Phila. Airport, Red Lion Road, just east of Roosevelt Blvd. Meet will conform to regular N.A.A. rules though N.A.A. license is not required. Besides the regular A, B, C class events there will be a stunt event in which any stunt may be used but those involving the use of chemicals. There is no limit to the number of flights necessary to complete the stunt. Entrants should communicate with William H. Lukens, 5507 Boyer Street, Philadelphia.

The 7th annual Southern Wisconsin & Northern Illinois model airplane meet will be held at the Rock County Airport on U.S. Highway 51, 8 miles north of Beloit, Wis., on May 12. Events are: Classes A, B, C gas division and one open class, rubber fuselage event. N.A.A. rules will be adhered to. Further data may be obtained from Conrad Hansen, Jr., 2372 Riverside Drive, Beloit.

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Fundamentals of Model Plane Design

(Continued from page 11)

edges follow line CC'. Thus the blades are formed by cutting away the block on both sides of a surface extending between lines AA' and CC'. The exact cutting procedure will be explained later.

From examination of the figure it is obvious that the proportions or measurements of the block affect the relative positions of the lines forming the edges of the propeller blades. In turn, their relative positions determine the pitch and the area of the blades. Thus it is obvious

that the measurements of the length, width and depth of the block have a definite bearing on the vital characteristics of the propeller. For any definite set of block measurements, the propeller will have definite values of diameter, pitch and blade area, when it has been carved out. Therefore when a propeller is required with particular values of these three characteristics all that is necessary to produce it is to cut it from a block of the correct size and proportion. Of course the block sizes that will give certain diameters, pitches and blade areas must be known.

Therefore, as the value of these three characteristics for your first power plane has already been determined, all that is required now is to lay out a propeller block with the dimensions that will assure them.

This is not a difficult matter. The length of the block is the first thing to determine. Inasmuch as the block must be as long as the propeller (if it is to be of the regular two-bladed type), its length will be at least 8 inches. (For the correct diameter was determined as 8 inches.) To allow for irregularities in the wood at the ends of the block, the block should be 8-1/8 inches long.

Determining the Pitch

The *proportion* of the block width to depth determines the pitch of the propeller. The larger the depth is relative to the width, the larger the pitch will be. In Fig. 25 the end of the block is indicated by ACBD. AC is the width and CB the depth. Now, if line AC is extended to point M until it is equal in length to the blade tip circle, line AB to N and line MN is drawn perpendicular to line AM at M, then triangles BAC and NAM are similar. Consequently line MN is the same proportion of line AM as line CB is of AC. However line MN represents the pitch of the propeller (see article No. 9) and AM the blade tip circle which is πD inches in length. The required pitch and the diameter is known to be 12.5 inches and 8 inches respectively; consequently their relative values and the relative lengths of CB and AC are known, for:

$$\frac{AM}{MN}=\frac{AC}{CB}=\frac{\pi D}{P}=\frac{25.14}{12.5}=2.01.$$

Therefore the width AC is twice the depth of the block. No matter what size propeller you may wish to make for any model, this is an excellent proportion.

How to Obtain the Correct Blade Area

The correct proportion of the width to depth is known, but its actual size must be found. The amount of area the blades are to have determines their length. The more the area the larger they will have to be, but in any given case their sizes must always be proportional to the pitch and diameter.

The simplest way to determine their correct lengths is by means of the table which appears on the first page of this article. It shows the pitches for any particular diameter in the lefthand vertical column, *when the block width is twice the depth.* In the body of the table the correct blade areas for *one blade* are shown for various values of block width, indicated

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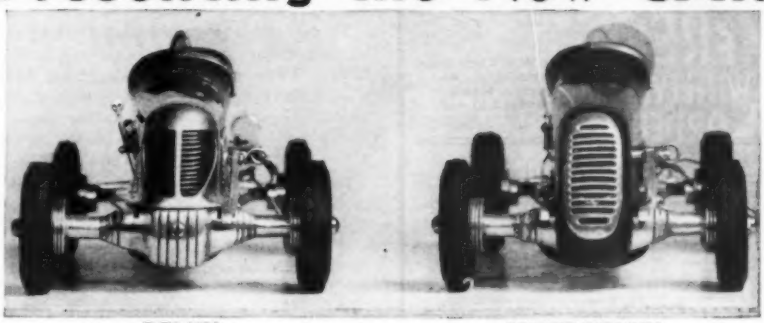

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1/16 x 1/8	.20
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1/8x1/4	.55
3/16 sq.	.50
1/4 sq., 100 for	.80
1/4 sq., 40 for	.50
1 sq., 8 for	.25
36" Sheets Per 20	
1/32 x 2	.15
1/16 x 2	.18
1/16 x 3	.36
3/32 x 2	.21
3/32 x 3	.42
1/8 x 2	.23
1/8 x 3	.46
1/4 x 2	.42
1/4 x 3	.84
1/2 x 2	.75
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18" Planks	
1 x 1½ each	.05
1 x 2 each	.08
1 x 3 each	.10
1 x 6 each	.18
2 x 2 each	.13
2 x 3 each	.18
2 x 4 each	.23
3 x 6 each	.30
3 x 6 each	.70
Balsa Prop. Blocks Per Doz.	
1/2 x 2/4 x 5	.05
1/2 x 2/4 x 6	.06
5/8 x 1 x 7	.14
3/4 x 1 x 8	.18
3/4 x 1 1/2 x 10	.25
3/4 x 1 1/4 x 12	.30
1 x 1 1/2 x 15	.48
Balsa Nose Blocks 1"x2"x3" 6 for	.11
1"x3"x3" 6 for	.18
2"x2"x2" 6 for	.15
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1/16 x 1/4 x 15" Doz.	.06
Gross	.65

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5" Doz.	.30
6" Doz.	.38
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10" 6 for	.40
12" 6 for	.55
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7" 6 for	.40
8" 6 for	.45
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1 1/2 Doz.	.35
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SANDPAPER 6 assorted sheets to package. 12 Packages	.84
COLORLESS CEMENT OR CLEAR DOPE 1/2 oz. Bottles, Doz.	.30
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2 oz. Bottles, Doz.	.60
3 oz. Bottles, 6 for	.59
Qt. .75; gal. 1.50	
COLORED DOPE 1/2 oz. Bottles, Doz.	.35
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3 oz. Bottles, 6 for	.60
1 Quart	.75
INSIGNIAS Dozen sheets	.36

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.034, 100 ft.	.35
MODEL DOPE BRUSHES Small, Doz.	.10
Gross	.75
Regular Size, 2 Doz.	.50
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White	.12
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3/16 Flat, 225 ft.	.60
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Gross	.75
O.D. TUBING 1/16", 6 ft.	.25
3/32", 6 ft.	.28
1/8", 6 ft.	.32
3/16", 6 ft.	.43
1/4", 6 ft.	.50
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BUSHINGS Small, 100	.15
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Gross	.55
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at the heads of the vertical columns. The corresponding depth values are just one-half the width values shown.

To determine the width and depth of the block for your propeller, proceed as follows. The model being designed here should have a diameter of 8 inches and a total blade area of 7.2 square inches. The propeller will have two blades so the area of one blade will be 3.6 square inches.

Note the 8 inch diameter value in the second vertical column from the left. Then follow across the table to the right until you come to the blade area value nearest in value to 3.6 square inches in the same *horizontal* column. This value is 3:55 and lies in the vertical column at the top of which appears the block width value of 1-3/8 inches. The required area is 3.60, slightly more than 3.55, so the width will be about 1/64" larger, or 1-25/64". This is the correct width of your propeller block. The depth, in this case, is one-half this value or 0.695 inches; 11/16 inches (full).

Thus the correct dimensions of the block from which you can cut a two-blade propeller with a diameter of 8 inches, a pitch of 12.5 inches and a blade area of 7.2 inches, is: length 8 1/8 inches, width 1-25/64 inches and depth 11/16 inches (full).

Blade Area Determined By Formula

The blade area of a propeller of *any proportion or size* may be found by means of the following formula:

$$a = \left(\frac{(\sqrt{w^2+d^2})+d}{2}\right)0.4D,$$

in which a = the area of *one* blade, w = the block width, d = the block depth and D = the propeller diameter.

As an example, the dimensions of the block are worked out as follows:

$$3.6 = \left(\frac{(\sqrt{w^2+(w/2)^2})+w/2}{2}\right)0.4(8).$$

In the formula w/2 has been substituted for d, as d equals one-half w. Then:

$$3.6 = \left(\frac{\left(\sqrt{\frac{5w^2}{4}}\right)+\frac{w}{2}}{2}\right)0.4(8).$$

$$\text{or, } 3.6 = \left(\frac{\frac{2.24w}{2}+\frac{w}{2}}{2}\right)3.2 = \left(\frac{3.24w}{2}\right)3.2$$

$$= (0.81w)\ 3.2 = 2.59w.$$

$$\text{Then, } w = \frac{3.6}{2.59} = 1.39 \text{ inches,}$$

or 1-25/64 inches; a little more than 1-3/8 inches.

$$\text{Then } d = \frac{1\text{-}3/8}{2} = 11/16 \text{ inches (full).}$$

By formula the dimensions of the block are then: length, 8-1/8 inches; width, 1-3/8 inches (plus); depth, 11/16 inches (full).

Now, when you undertake the actual construction of your plane, you will be able to cut out your propeller from a block of correct size and with the certainty that it will function on your plane in a satisfactory manner.

Next month the problem of cutting out the propeller will be discussed.

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See page 39

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